THE RESILIENCE OF OLDER ADULTS RECEIVING HOSPITAL CARE: VALIDATION OF THE MAKING IT CLEAR QUESTIONNAIRE, AND AN EXPLORATION OF PROTECTIVE AND VULNERABILITY FACTORS

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Abstract

Background

'Resilience' is the process by which individuals adapt to and manage adversity. Through the identification of older adults who may struggle to 'adapt well' following health difficulties, resilience research may support health improvement. As resilience is influenced by an individual's personal characteristics, resources, and physical and social environment, resilience measures that comprehensively capture resilience are important. Furthermore, due to the contextual nature of resilience, research findings should not be generalised across populations who experience unique adversities. Despite this, most resilience measures used with older adults assess resilience at the individual level, and current resilience research has largely recruited community-dwelling older adults, preventing the findings from being generalised to those receiving hospital care.

The Making it CLEAR (Community Living, Enablement and Resilience) (MiC) questionnaire was designed to measure the individual and environmental determinants of an older adult's resilience. This work focuses on assessing its validity with a population of older adults receiving inpatient care and uses the data to investigate the protective and vulnerability factors of this population.

Methods

The study analyses data collected from older adults recruited during acute hospital admission across three Medicine of the Elderly wards. Exploratory factor analysis and item analysis was used to assess the validity of the MiC questionnaire, while item response analysis identified the key 'resilience needs' of the population. Regression analyses identified the protective and vulnerability factors of the sample and investigated the mediatory effect of self-efficacy on the relationship between frailty and resilience.

Results

Exploratory factor analyses and item analysis demonstrated acceptable construct validity, internal consistency, discriminant validity, and item difficulty for each subscale of the MiC questionnaire. Multiple regression analysis found that gender, marital state, perceived physical and mental health, and receipt of a daily care package predicted individual determinants of resilience. Religion, frailty status, perceived physical and mental health, and visual impairment predicted environmental determinants of resilience. Self-efficacy was found to mediate the relationship between frailty and resilience; and low self-efficacy, poor person-environment fit, and a lack of social support from friends were identified as the most common resilience needs.

Conclusion

The results demonstrate that the MiC questionnaire is a valid measure of both the individual and environmental determinants of resilience of older adults during hospital admission, thus supporting the use of the MiC questionnaire with this population. In addition, the regression analyses suggest potential characteristics of older adults with low resilience, while the identified resilience needs are suggested as potential priorities for targeted intervention.

Keywords - Resilience; older adults; assessment; hospital

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Soli Deo Gloria

Contents

List of Tables

List of Figures

Glossary

TERM	DEFINITION
ADVERSITY	A state or instance of serious or continued difficulty or misfortune that poses a significant risk of a negative outcome.
AGEING IN PLACE	Refers to an older adult living in the community, with some level of independence.
ASSETS	Refers to individual or social protective factors.
EFFECTIVE COPING	Effectively managing adversity to function at an optimal level.
ENVIRONMENTAL DETERMINANTS OF RESILIENCE	Environmental factors which have an influence on an individual's resilience.
FRAILTY	A state of increased vulnerability resulting from a decline in the body's physical and psychological reserves and the outcomes of multiple long-term conditions.
GENERAL SELF-EFFICACY	An individual's belief in their ability to cope with, and succeed in, a wide range of situations.
HEALTHY AGEING	The process of developing and maintaining the functional ability and health-related attributes that enable older adults to be and do what they have reason to value.
INDIVIDUAL DETERMINANTS OF RESILIENCE	Individual factors which have an influence of an individual's resilience.
MASTERY	An individual's belief in their ability to influence the environment and bring about desired outcomes through their own skill or knowledge.
MEDICINE OF THE ELDERLY WARDS	Acute hospital wards which provide multidisciplinary care for individuals aged 65 or older, who are admitted to hospital with a 'geriatric syndrome'.
MULTIDISCIPLINARY TEAM	A group of professionals from multiple clinical disciplines who together make decisions regarding the recommended treatment of individual patients.

POSITIVE ADAPTATION	Occurs when recovery following an adversity is 'beneficial' or 'effective'.
PROTECTIVE FACTOR	Specific assets and resources that are necessary for the process of resilience to occur.
RESILIENCE	The process of effectively negotiating, adapting to, or managing significant sources of stress or trauma.
RESOURCES	Refers to community protective factors.
RISK	Describes the chance of adversity translating into a negative outcome.
SUCCESSFUL AGEING	Old age characterised by freedom from illness and disability, and high cognitive, physical, and social functioning.
VULNERABILITY FACTOR	A detrimental influence on an individual's resilience.

Acronyms

ACME	Average causal mediation effect
ADE	Average direct effect
ADL	Activities of daily living
ANOVA	One-way analysis of variance
BGS	British Geriatrics Society
BI	Barthel Index
BRS	Brief Resilience Scale
CD-RISC	Connor Davidson Resilience Scale
CFA	Confirmatory factor analysis
CFS	Clinical Frailty Scale
CGA	Comprehensive Geriatric Assessment
CI	Confidence interval
CTT	Classical Test Theory
EDoR	Environmental determinants of resilience
EFA	Exploratory factor analysis
GSE	General self-efficacy
GSES	Generalized Self-Efficacy Scale
$GVIF^{1/(2*Df)}$	Generalised variance inflation factors
HRQoL	Health-related quality of life
IDoR	Individual determinants of resilience
IQR	Interquartile range
IRT	Item Response Theory
KMO	Kaiser-Meyer-Olkin
MCS	Mental Component Summary
MDT(s)	Multidisciplinary team(s)
MiC	Making it CLEAR
MIIRM	Multidimensional Individual and Interpersonal Resilience Measure

MoE	Medicine of the Elderly
NGSES	New General Self-Efficacy Scale
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
OLS	Ordinary Least Squares
PCP(s)	Primary care provider(s)
PCS	Physical Component Summary
PE fit	Person-environment fit
PoC	Package of Care
QMU	Queen Margaret University
RCP	Royal College of Physicians
RCT(s)	Randomised controlled trial(s)
RIE	Royal Infirmary of Edinburgh
SA	Successful ageing
SD	Standard deviation
SES	Self-Efficacy Scale
SIMD	Scottish Index of Multiple Deprivation
SMD	Standardised mean difference
TLI	Tucker-Lewis Index
TSSE	Task-specific self-efficacy
VIF	Variance inflation factors
WHO	World Health Organisation

Chapter 1 Introduction

1.1 Introduction

Advancements in medical and social care mean that the general population is living longer and the number of older adults worldwide is increasing. According to the World Health Organisation (WHO) (WHO 2012), the population of older people (individuals aged 65 or older) will increase to two billion by 2050, while in Scotland the number of people over the age of 65 is expected to increase from 311 in 2015, to 397 in 2039, per 1000 population (National Records of Scotland 2015).

Many older people face health and social compromises, such as multimorbidity, frailty, functional decline, and dementia (Hayman et al. 2017). In 2018-19 there were 8.76 million admissions of individuals aged 65 or older into English hospitals, and older adults admitted to Medicine of the Elderly (MoE) wards accounted for 4.9% of all hospital admissions and 13.8% of total inpatient bed days (National Health Service (NHS) Digital 2019). These figures demonstrate a 4.5% increase in older adults admitted to hospital between 2017-18 and 2018-19, and a 6.4% increase in the number of admissions to MoE wards (NHS Digital 2018a).

Due to patient characteristics and the hospital environment, older adults admitted to MoE wards have an increased likelihood of complications during hospital stays (Capezuti et al. 2011). These complications can include functional decline, fall-related injury, and delirium.

Between 15% and 76% of hospitalised older adults are discharged from hospital with worsened performance in at least one activity of daily living (McCusker et al. 2002; Covinsky et al. 2003; Boyd et al. 2008). Of these, less than half will return to their previous level of functioning at three months post-discharge, and for some it will result in a permanent loss of independent living (Covinsky et al. 1997; Boyd et al. 2009). Furthermore, around 5% of older adults fall during hospitalisation (Rubenstein 2006; Schwendimann et al. 2006) and approximately 3% to 10% of these falls result in injuries which may cause further functional decline (e.g. hip fracture) and influence the length of admission or need for rehabilitation services (Magaziner et al. 2000; Rubenstein and Josephson 2002; Schwendimann et al. 2006; Slade et al. 2017). Regarding confusion, it is estimated that around 48% of older adults admitted to a MoE ward present to hospital with confusion, either as a result of delirium or

cognitive impairment (Bryans et al. 2015). When considering delirium alone, earlier publications suggest that between 14% and 24% of older adults are admitted to hospital with delirium, and up to 56% of additional older adults will develop delirium during their hospitalisation (Dubois et al. 2001). Delirium is associated with many poor hospital outcomes such as higher mortality rates, increased length of admission, greater functional decline, and persistent cognitive impairment (Inouye et al. 1998; McCusker et al. 2003; McAvay et al. 2006; Fong et al. 2012). Following hospital discharge, any one of these complications increases the likelihood of emergency service use, readmission to hospital, nursing home placement, and death (Capezuti et al. 2011). Reducing the risk of these outcomes is therefore key in supporting individuals to 'age well'.

Over the past four decades, paradigms of understanding and responses to old age have undergone significant changes. Unlike traditional views of ageing, which focused on the deficits and losses associated with later life, focus is now given to well-being and 'healthy ageing' (Fullen and Gorby 2016). As a result, current political and health literature highlights the importance of older adults' quality of life, regardless of ill health or physical and cognitive impairment (Fillit and Butler 2009; The Scottish Government and COSLA 2010; NHS Scotland 2014; NHS 2019). Newer conceptualisations of ageing also consider the effect of the environment on older adults' health, recognising that an individual's environment is just as much a part of them as their organ systems and functional abilities are (Hayman et al. 2017). Accordingly, focus has recently turned to the concept of 'resilience' as it is understood to result from the interplay between an individual, their environment, and an adversity (Johnson and Wiechelt 2004; Wild et al. 2013). Recognition of the importance of resilience in older adults is evident within multiple disciplines, including psychology, psychiatry, medicine, occupational therapy, and nursing (Earvolino-Ramirez 2007).

Where adversities, protective factors, vulnerability factors, and resilience indicators can be identified, resilience interventions may be effective in addressing older adults' resilience, and the impact that low resilience may have on their lives (Gijzel et al. 2017). In addition to identifying opportunities for intervention, it is important to enhance research knowledge about older adults' resilience more generally, specifically across various older adult populations, as current research has primarily focused on the resilience of community-dwelling older adults.

Collecting this information requires assessments that capture the multidimensional nature of older adults' resilience. However, studies which have measured the resilience of community-dwelling older adults have predominantly measured the individual determinants of resilience, neglecting the environmental determinants (Windle et al. 2011).

Through the recruitment of older adults admitted to a MoE ward and the investigation of their 'resilience needs', protective factors, and vulnerability factors, this thesis attempts to contribute to the understanding of resilience in older adults receiving MoE care. Additionally, this thesis seeks to contribute to the measurement of resilience in older adults, through the validation of the Making it CLEAR (Community Living, Enablement and Resilience) (MiC) questionnaire, a resilience measure which assesses both the individual and environmental determinants of older adults' resilience (Queen Margaret University (QMU) and NHS Lothian 2015).

This chapter provides background to the thesis; the first sections (1.2-1.4) give an overview of models of ageing and geriatric care, and the contribution of resilience research to these. Section 1.5 provides a summary of current directions in resilience research with older adults. Following this, focus turns to the importance of evidence-based practice (Section 1.6) and NHS Healthcare Outcomes (Section 1.7), and how better understanding of the concept of resilience may contribute to their realisation. Section 1.8 identifies the unique contribution of the current study. Finally, Section 1.9 discusses the literature strategy that was followed, and Section 1.10 provides the structure for the thesis.

1.2 Models of ageing

With population ageing there is increasing interest in how one ages 'successfully' (Bowling and Iliffe 2006). Historically, there was a tendency to focus on the absence of disease or functional impairments to characterise 'successful ageing' (SA) (Rowe and Kahn 1987). Consequently, any level of illness or impairment had negative connotations that led to the assumption that often 'normally ageing' older adults had a reduced quality of life (Holstein and Minkler 2003; Pruchno et al. 2015). As a result, this model of successful ageing is widely disputed by researchers who suggest that it is exclusionary and unable to fully capture a

phenomenon that is shaped by many factors, including genetics and environment (Cevenini et al. 2008).

More recently the concept of SA has been replaced by the concept of 'healthy ageing', which is understood to be characterised by quality of life, rather than by a life free of ill health or functional impairment (Fillit and Butler 2009). This transition has brought about an increase in research focused on ensuring that healthy ageing reflects the lived experiences and opinions of older adults.

In a qualitative study conducted with community-dwelling older adults who were frequent users of healthcare services, Bryant et al. (2001) found that older adults defined healthy ageing as 'going and doing' something meaningful. Bryant et al. (2001, p. 940) summarise that 'this is health described not as the absence of disease or disability, nor as an ideal, but as a reflection of the lived experience of daily life, as a capacity to engage meaningfully with and respond to the contingencies of daily life regardless of afflictions and (dis)abilities'. These findings are in contrast with the theory of SA, which would conceptualise participation in meaningful activities as a factor related to SA, or a result of being free from illness or functional limitations (Bryant et al. 2001).

Several studies, across a range of countries, have asked older adults to identify the most important aspects of healthy ageing. In a comparative analysis of populations from ten countries the most important features of healthy ageing were: 'having good health', 'being satisfied with life', 'having friends and family', 'adjusting to changes', and 'taking care of oneself' (Fernández-Ballesteros et al. 2010). These findings are supported by research conducted with both US and Japanese populations (Phelan et al. 2004; Matsubayashi et al. 2006). Further research has also found that multidimensional and holistic models of healthy ageing, which incorporate measures of health, functioning, social engagement, self-efficacy, optimism, and environmental characteristics (e.g. crime rate, social capital) are able to predict healthy ageing and perceived quality of life most accurately, and ensure that efforts to promote health are of relevance to older populations (Bryant et al. 2000; Bowling and Iliffe 2006). The development of models of healthy ageing has built upon these findings by suggesting that individuals have 'personal health systems' which support older adults to engage in meaningful activities and relationships (Potempa et al. 2010).

These developments in understanding of healthy ageing have resulted in the understanding that, while often associated with good physical, cognitive, and functional abilities, healthy

ageing is not reliant on the absence of limitations but is determined by a level of health and adaptation to the ageing process acceptable to the individual (Bryant et al. 2001). This definition of healthy ageing is also in line with further literature which suggests that increased frailty, or the presence of illness or impairment, does not necessarily result in a reduced quality of life (Fillit and Butler 2009; Martin 2016).

The concept of healthy ageing has been readily accepted within policy and research. One example is the WHO's work on ageing. In 2015 it was announced that the focus of the WHO's 'framework for action on ageing and health' for the following 15 years would be on healthy ageing, which they defined as 'the process of developing and maintaining the functional ability that enables well-being in older age. Functional ability comprises the health-related attributes that enable people to be and do what they have reason to value' (WHO 2015, p. 41). However, while this framework is built around a conceptualisation of healthy ageing that focuses on an older person's ability to do the things they value, rather than the absence of disease (WHO 2015), there is still some concern amongst researchers who feel that this definition reduces healthy ageing to functional abilities, a consequence of illness, disease or accident, and re-medicalises the concept of health (Fernández-Ballesteros et al. 2017). This is reflected in models of geriatric care.

1.3 Models of geriatric care

While models of ageing have developed over time to become more multidimensional and holistic, models of geriatric care remain more medical. Over the last 30 years changes in healthcare systems, as well as a growing older population, have led to the development of several geriatric models of care for hospital settings. However these largely focus on the prevention of complications that occur more frequently in hospitalised older adults, which may include functional decline, fall-related injuries, malnutrition, pressure ulcers, urinary tract infections, and delirium (Capezuti et al. 2011; Health in Ageing 2017; WHO 2018); as well as the hospital factors that may contribute to them (Capezuti et al. 2011).

The aforementioned complications are often referred to as 'geriatric syndromes' as they do not fit into discrete disease categories (Capezuti et al. 2011; Health in Ageing 2017; WHO 2018) and can result in loss of independence, a greater length of stay, increased use of rehabilitation services, greater chance of hospital readmission, and can reduce the chances

of survival (Capezuti et al. 2011). Additionally, these risks are increased by greater frailty and cognitive impairment which are prevalent in older adult populations (Gill et al. 1999; Fried et al. 2001).

A review of six commonly employed geriatric models of care in hospital settings recognised that each share a common set of general objectives. These models were the Hospital Elder Life Programme (Inouye et al. 2006); the Advanced Practice Nurse Transitional Care Model (Naylor and Keating 2008); the Care Transitions Intervention (Coleman et al. 2004); Geriatric Consultation Services (Agostini et al. 2001), Acute Care for the Elderly Units (Palmer et al. 1994), and Nurses Improving the Care of Health System Elders (Fletcher et al. 2007). The common set of objectives involved the education of healthcare providers in core geriatric principles, targeting risk factors for complications, incorporating patient and family choices and treatment goals, employing evidence-based interventions, promoting inter-disciplinary communication, and emphasising discharge planning (Capezuti et al. 2011).

Considering the importance of environment and meaningful activity emphasised by models of healthy ageing, these models of geriatric care recognise the independent and significant role that the hospital environment can play on the health outcomes of older adults (e.g. restricted movement may cause functional decline, falls or pressure ulcers), seek to ensure that complications do not arise due to system or staff-level problems, and recognise the importance of patient choice. However, they are still largely focused on the recognition of 'negative' patient characteristics, particularly multimorbidity, frailty and cognitive impairment, which increase the risk of adverse outcomes (Capezuti et al. 2011).

The influence of these models can be seen clearly in areas of healthcare, for example in the existence of health indicators that attempt to quantify health based on illness or impairment (e.g. frailty measures (Clegg et al. 2013)). However, these calculations do not recognise the definition of 'health' put forth by Bryant et al. (2001), which emphasises the importance of the older adult being able to accept their level of health, participate in meaningful activities, and adapt in the face of adversity rather than them experiencing no limitations.

1.4 Contribution of resilience

Since older adults often experience multiple health problems that include psychological and social as well as physical dimensions, their perceptions of health and well-being depend on more than just clinical and functional status (Bryant et al. 2001). Furthermore, while static measures of frailty can predict risk of death, institutionalisation, delirium, and falls, it has not been proven that they can predict recovery (Olde Rikkert and Mells 2019).

In response, recent research has focused on 'wellness models', which are concerned with identifying factors that support and promote the health and well-being of older adults (Hornby-Turner et al. 2017). One area in which this 'wellness' approach can be seen is in the increasing literature base focused on the resilience of older adults (Fullen and Gorby 2016).

Accordingly, models of resilience seek to explain 'the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress' through the identification of both protective and vulnerability factors (American Psychological Association 2018). The majority of resilience researchers position the process of resilience as an interaction between the adversity, the person, and the environment (Johnson and Wiechelt 2004; Wild et al. 2013) and resilience models reflect the multidimensional influence of social, community, and individual variables on an individual's resilience, as well as the effect of clinical factors (e.g. Hardy et al. 2004; Earvolino-Ramirez 2007; Windle 2012; Hicks and Conner 2014; Wister et al. 2016; Hayman et al. 2017).

The shift in focus from outcomes of successful ageing to outcomes of healthy ageing is echoed by models of resilience which generally regard perceived quality of life as the primary outcome of resilience (Hicks and Conner 2014). This makes resilience, like healthy ageing, an achievable goal for all older adults regardless of ill health (Hicks and Conner 2014). Furthermore, it has been recognised that resilience is promoted when individuals have the ability to control their participation in meaningful occupations (Rutter 1993). This resonates with the suggestion that older adults define health according to their ability to participate in activity (Bryant et al. 2001).

Concerning MoE care, resilience has the potential to improve the outcomes of older adults during and following hospital admission as assessing it may enable clinicians to identify older people who are likely, and those who may struggle, to 'adapt well' after acute hospital admission, thus supporting customised management and interventions (Hardy et al. 2004;

Hicks and Conner 2014; Gijzel et al. 2017; Hayman et al. 2017). However, the implementation of resilience assessments and interventions in clinical practice is reliant on the development of a robust evidence base. Recent recognition that resilience is malleable and can be promoted in later life has led to an increase in resilience research which focuses on the benefits of resilience and how to promote resilience through use of programmes and interventions, thus paving the way for evidence-based resilience interventions (Fullen and Gorby 2016). Despite this, individual factors currently dominate the list of resilience resources, limiting its potential to geriatric research and practice (Wild et al. 2013).

1.5 Current directions in resilience research with older adults

Previous resilience research has predominantly focused on the lived experiences of children and adolescents (Aburn et al. 2016; Hayman et al. 2017) and has sought to identify protective factors and processes which enable children to successfully adapt in the face of adversity (Tusaie and Dyer 2004; Luthar 2006). The findings of this research have subsequently begun to shape both policy and practice (e.g. the 'Getting It Right For Every Child' framework (Scottish Government 2016)).

Given the health and social compromises faced by older adults, resilience is also important in later life, as it may promote both the health and quality of life of older adults (Hicks and Conner 2014; Hayman et al. 2017). However, in comparison to children and adolescents, far less is known about the adversities, protective factors, vulnerability factors or determinants of resilience in later life (Luthar et al. 2000; Hildon et al. 2008; Windle 2012). Therefore, from both a practice and policy perspective, it would be beneficial to investigate how the resilience of older adults can be promoted (Pruchno and Carr 2017), especially as carrying out research within priority areas is crucial for supporting evidence-based practice (Kielhofner 2006). In view of this, there has been a call for research investigating the resilience of older adults and its influence on their achievement of positive outcomes (Luthar et al. 2000).

Previous research which has sought to answer this call has largely focused on the resilience of community-dwelling older adults. While this research may support community-based health promotion efforts, resilience research findings are context-dependent (Vanderbilt-Adriance and Shaw 2008). Consequently, the findings of research conducted with older adults living in the community should not be generalised to older adult populations

experiencing different and potentially more acute adversities (Windle 2011; Schwarzer and Warner 2013; Hoare 2015). Various researchers have recommended that, when undertaking resilience research, participants should be recruited from one specific and defined population (Luthar et al. 2000; Bolton et al. 2016). It is further advised that this research should seek to identify protective factors and vulnerability factors which influence participants' ability to be resilient in the context of a specific adversity or distinct vulnerability factor (Luthar et al. 2000; Bolton et al. 2016). It is through the recruitment of a specific population group that researchers can be confident that the distinguishing features of resilient participants are their protective factors and processes. Once identified, these protective factors and resilience indicators may aid complex healthcare decision-making and provide means to explore new opportunities for building and maintaining resilience (Gijzel et al. 2017).

Additionally, there is a need for future research to investigate the resilience of populations that are currently 'ignored or undervalued' (Wild et al. 2013). In particular there is a dearth of resilience research conducted with populations of older adults experiencing ill health, disability or acute medical care (Hardy et al. 2004; Windle et al. 2010). This is recognised by researchers who advise that future research should investigate whether resilience is important for subjective well-being when ill health is a serious threat, and should study the relationship between resilience and functional status (Hardy et al. 2004; Hildon et al. 2008; Windle et al. 2010; Pruchno and Carr 2017). It is further recommended that these aims should be achieved through the recruitment of a clinical or 'institutionalised' sample of older adults (Hardy et al. 2004; Windle et al. 2010).

Hicks and Conner (2014) recognise that both qualitative and quantitative studies are needed with these populations. Qualitative studies are needed to look at the lived experience of resilience ageing so that attributes, antecedents, and consequences of resilience are identified and can support the development of quantitative resilience measures. Quantitative research is then needed to assess the validity of the resilience measures and test the relationships between protective factors and resilience attributes. Once these are confirmed, studies can be carried out to test the clinical effectiveness of resilience measures and interventions in improving patient outcomes and quality of life, thus supporting evidence-based practice (Hicks and Conner 2014).

1.6 Evidence-based practice

In 1972, Cochrane stated that healthcare resources should be used to provide interventions that have been proven effective by well-designed trials with samples that enable generalisation of findings. Though published three decades ago, evidence-based practice continues to rely upon the use of external evidence to demonstrate both clinical and cost effectiveness, and to support clinical judgement regarding the interventions and assessments used (Taylor 2007). This external evidence can emerge from a variety of sources, including research and patients' own perspectives, and ensures that healthcare professionals do not base their clinical decisions on opinion (Sudsawad 2006).

As the population ages, and healthy life expectancy increases, providing geriatric care becomes increasingly complex (Capezuti et al. 2011). As such, evidence-based protocols and interventions are relied upon to reduce the occurrence of poor outcomes during hospital admission. This is recognised broadly by geriatric models of care which state that the evidence-based interventions and protocols are needed to guide geriatric hospital care (Capezuti et al. 2011). Research can also provide evidence regarding the validity and reliability of assessments, thus ensuring the quality of the information collected by researchers and healthcare professionals, and the accurate identification of priorities for future interventions as well as the population who may benefit from them. This, in turn, ensures the quality and usefulness of the care provided in acute MoE wards, and enables services to meet desired healthcare outcomes.

1.7 NHS healthcare outcomes

In January 2019, the NHS Long Term Plan was published, outlining the vision for the medium- to long-term future of the NHS. The report acknowledged the need to support individuals to age well, stating that while people are living longer the extra years of life are not always spent in good health, and that multimorbidity, frailty, and dementia mean that the average older adult spends around 2.5 to three years with 'substantial' care needs (NHS 2019). Accordingly, the report recognised that a growing and ageing population will inevitably increase the number of people requiring NHS care, and the intensity of support they receive. Data collected by NHS Digital has proved this statement to be true. Since 2010-11 there has been

a 50% increase in emergency attendances among those aged 65 to 79 and a 45% increase among those aged over 80, while there has been a 6.4% increase in the number of admissions to MoE wards between 2017-18 and 2018-19 (NHS Digital 2018a; 2018b; 2019). More broadly, the number of emergency readmissions (within 30 days of discharge) has increased, with the figure rising by 22% between 2013-14 and 2017-18. Additionally, 22% of these readmissions occurred within 48 hours of discharge (Healthwatch England 2018). The majority of readmissions are attributed to older adults (AgeUK 2019).

Ensuring the appropriateness and effectiveness of hospital care in MoE wards is therefore key to the management of complex and high-cost patients. This is recognised by the National Service Framework for Older People which aimed to ensure that appropriate specialist care is provided for older adults in hospital settings, and that they receive the maximum benefit from having been in hospital (standard four) (Department of Health 2001). To improve care and optimise quality of life for older adults receiving hospital care, this framework identified that multidisciplinary teams (MDTs) must provide care which encompasses all stages of hospital admission (i.e. from emergency response to discharge planning) and should promote dignity and independence (Department of Health 2001).

However, it is also recognised that while an increasing number of older adults will live with complex health and care needs, there are also growing numbers living without any significant need for support (AgeUK 2019). Therefore, it is too simplistic to say that a growing older population results in a greater burden of disease and disability as this ignores the potential for health to improve in later life, and fails to account for the fact that developing more appropriate services and interventions may reduce demand for more expensive care (AgeUK 2019).

More broadly then, various NHS policy documents have stated that priority should be given to optimising quality of life in later life across all areas of health and social care (The Scottish Government and COSLA 2010; NHS Scotland 2014; NHS 2019). To help achieve this goal in Scotland the Scottish Government launched the Reshaping Care for Older People programme (The Scottish Government and COSLA 2010). The main aim of this programme is to encourage a move towards a preventative approach of care, which seeks to increase the proportion of older people who remain active, healthy, and independent for longer (The Scottish Government and COSLA 2010). If successful, preventative measures are also seen as a way to potentially reduce care costs, through reduced need for healthcare services (NHS Scotland

2014). One of the proposed long-term outcomes associated with this programme was the optimisation of positive mental health and well-being of older adults in Scotland, as being mentally well in later life is understood to promote adaptability, resilience, and the ability to cope with loss and decline (NHS Scotland 2014; National Institute for Health and Care Excellence (NICE) 2008).

In line with these recommendations, which highlight the need to develop the management of high-cost patients in order to improve health outcomes, and control healthcare expenditure (Department of Health 2005), it is proposed that resilience research and resilience interventions may enable the realisation of NHS policy in two ways.

Firstly, through advancing the knowledge base of resilience in older adults, community support services may be better equipped to provide evidence-based interventions which enable older adults to stay within their communities, and experience proactive maintenance of their well-being (Hardy et al. 2004). The success of these community-based resilience interventions may subsequently reduce the need for healthcare services (Martin 2016).

Secondly, in acute hospital settings, resilience research may enable clinicians to identify older people who are likely to experience adverse outcomes following acute hospital admission, thus supporting complex decision-making, customised management, and evidence-based interventions, in the healthcare of older adults (Hardy et al. 2004; Hicks and Conner 2014; Gijzel et al. 2017). As resilience may also aid in the successful transition from hospital to home, consideration of resilience in acute hospital care could also reduce the risk of hospital readmission (Esche and Tanner 2005).

1.8 Unique contribution of the current study

1.8.1 Rationale for Current Study

As the world's older population has grown, the importance and prevalence of geriatric research has also increased. Over the past four decades the emphasis of this research has evolved from illness models to wellness models, and from SA to healthy ageing, frailty, and resilience (American Geriatrics Society 2005). Resilience is understood to be 'the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma' (Windle 2011). It is widely suggested that resilience research has the potential to develop the

clinical care of older adults, through enabling the identification of those who are at risk of adverse outcomes following ill health, and facilitating the development of customised management and patient-centred interventions (Hardy et al. 2004; Hicks and Conner 2014; Gijzel et al. 2017; Hayman et al. 2017). Additionally, resilience research would complement the existing research that focuses on frailty as resilience may enable an older adult to adapt to the increased vulnerability caused by frailty (Freitag and Schmidt 2016).

However, there are two key challenges for geriatric resilience research.

Firstly, there is concern about the validity of resilience measures, most of which measure resilience at an individual level, without recognition of the physical and social environmental factors which also influence it (Windle et al. 2011). This is concerning as the process of resilience is understood to be an interaction between the adversity, the person, and the environment (Johnson and Wiechelt 2004; Wild et al. 2013), and is particularly problematic when considering the resilience of older adults, as research suggests that the influence of environmental factors on resilience is likely to be increased in advanced age (Hayman et al. 2017). Consequently, the exclusion of environmental factors limits the potential of resilience in both geriatric research and practice (Wild et al. 2013).

Secondly, much of the current resilience research has been conducted with community-dwelling older adults, who may not be experiencing ill health or acute adversity. This limits the applicability of current resilience research, as resilience is context-dependent (Vanderbilt-Adriance and Shaw 2008). Furthermore, research has suggested that the receipt of healthcare services and the healthcare setting that care is received in may impact upon older adults' health-promoting behaviours and psychological resources (Rodin 1986). As a consequence of the contextual nature of resilience and the unique nature of acute illness and inpatient hospital care, it is not appropriate to directly translate information about community-dwelling older adults' resilience to other older adult populations, particularly those receiving care in a MoE ward (Vanderbilt-Adriance and Shaw 2008). Accordingly, it has been recognised that there is a dearth of resilience research investigating the resilience of older adults who are experiencing ill health or are receiving inpatient care (Hardy et al. 2004; Windle et al. 2010).

The study presented in this thesis is expected to contribute to existing geriatric resilience research in two key ways. Firstly, through the validation of the MiC questionnaire, a resilience measure designed to assess both the individual and environmental determinants of older

adults' resilience (QMU and NHS Lothian 2015). Secondly, this research investigates the resilience needs, protective factors and vulnerability factors of older adults receiving care in a MoE ward, thus responding to the call for more resilience research with populations of older adults experiencing ill health and receiving inpatient care.

1.8.2 Research questions

In view of the above, this research aims to answer the following questions:

- Is the Making it CLEAR questionnaire a valid measure of older adults' resilience during hospital admission?
- What are the specific 'resilience needs' of older adults receiving acute inpatient care? How are they related to functional ability, health status, and care packages?
- What are the protective and vulnerability factors associated with the resilience of older adults receiving acute hospital care, and how do these vary across the resilience distribution?
- Is there a relationship between participants' self-rated resilience scores and frailty? Does self-efficacy mediate this relationship?

1.8.3 Implications of current study

It is proposed that, through answering these research questions, this study will support evidence-based practice and will contribute to scientific literature.

Through determining whether the MiC questionnaire is a valid measure of older adults' resilience in MoE wards, and identifying the population's resilience needs, this study has the potential to develop evidence-based practice by providing evidence of the quality of the MiC questionnaire, thus supporting its use in MoE wards, and by identifying priorities for future resilience interventions.

Furthermore, through the exploration of older adults' protective factors, vulnerability factors and resilience needs during an acute hospital admission, this research will contribute to scientific literature. Firstly, through strengthening current conceptualisations of older adults' resilience in a currently understudied population, and secondly, through exploring

environmental factors which influence their resilience, factors which have previously received less attention than individual ones.

1.9 Literature strategy

To provide context for the work, this thesis begins with literature review chapters exploring the history of geriatric and resilience research, as well as factors which affect older adults' resilience. As resilience is a relatively new, and continually developing, geriatric research topic, a broad approach to searching for literature for the background chapters was appropriate. One of the challenges in identifying relevant literature was that the majority of resilience research conducted with older adults involved the recruitment of community-dwelling older adults, and not those experiencing acute ill health. Therefore, while the background chapters primarily draw on the findings of geriatric research, some reference is given to literature which recruited younger, but medically unwell, individuals.

The lack of resilience research involving the recruitment of older adults from clinical care settings also resulted in the systematic review and meta-analysis, which is presented in chapter four, investigating the 'general self-efficacy' (GSE) of older adults receiving care. GSE is understood to be predictive of older adults' resilience (Lee et al. 2013; McClain et al. 2018). Therefore, it is suggested that any patterns identified in older adults' GSE may also be present in their resilience. The search strategy used for the systematic review and meta-analysis is included within chapter four.

1.10 Thesis purpose and outline

The purpose of this thesis is two-fold. Its first component aims to synthesise existing knowledge about older adults' resilience through a literature review. Through the inclusion of a systematic review and meta-analysis investigating the GSE of older adults receiving care, this literature review also seeks to contribute to attempts to understand the effect of a healthcare setting on the health-promoting behaviours and psychological resources of older adults.

The second component of this thesis presents the methods and findings of an empirical study focused on the resilience of older adults receiving care in an inpatient MoE ward, which was conducted in order to advance the measurement and conceptualisation of resilience in older adults.

The following provides an outline of the thesis structure:

Chapter 2 - Geriatric Research and Care

The chapter begins with an explanation of geriatric research and considers the nature of geriatric care and the provision of care within MoE inpatient hospital wards. The chapter continues with an exploration of the various focuses that have defined geriatric research over the past four decades. Much of the discussion reflects current understandings of how the concept of resilience has contributed to knowledge regarding the earlier concepts of successful ageing, healthy ageing, and frailty. Finally, the chapter explores the research addressing the impact of resilience on clinical geriatric practice.

Chapter 3 - Resilience

Having explored the development of geriatric research, the next chapter in this thesis focuses in more depth on the concept of resilience. Three waves of resilience research are presented in order to better understand where the current conceptualisation of resilience has developed from. The following section then explores the research available about the adversities faced by older adults, the influence of protective and vulnerability factors on their resilience, and finally, the outcomes of resilient older adults.

Chapter 4 - Self-Efficacy

In chapter three self-efficacy is identified as a key resilience resource for older adults. In the fourth chapter current conceptualisations of self-efficacy are presented, and its associations with older adults' resilience and clinical practice are discussed.

The fourth chapter also includes a systematic review and meta-analysis which investigated whether the GSE of older adults is affected by the receipt of healthcare, and whether older adults' GSE varies across healthcare settings. The chapter concludes by considering how the findings of this review relate to the current resilience research.

Chapter 5 - Methodology and Methods

This chapter details the rationale for the present study and the methods and approaches followed. The chapter begins by presenting the research aims and methodological underpinning. Subsequently, the chapter details the processes followed when recruiting participants, collecting data, and the statistical analysis conducted to answer each research question.

Chapter 6 - Results

Chapter six presents the results from the study. This chapter is structured to first display the participant characteristics and provide information about data completion. Following this the results are presented systematically to address each research aim. Interpretation of the results and decisions regarding each stage of analysis was made in line with the guidance regarding exploratory factor analysis, regression analysis, and mediation models.

Chapter 7 - Discussion

As with the results chapter, the discussion chapter systematically addresses each study aim and discusses the key findings within the context of current conceptualisations of older adults' resilience and the results of existing research.

Chapter 8 - Conclusion

Finally, chapter eight concludes the thesis with an overview of all the topics discussed, a summary of the findings of the work, and a consideration of its strengths and limitations. Implications for practice, policy, and suggestions for the direction of future work are also included.

Chapter 2 Geriatric Research and Care

2.1 Introduction

Gerontology is the study of ageing and older adults. This encompasses the study of physical, mental, and social changes in individuals as they age, the investigation of changes in society resulting from the ageing population, and the application of this knowledge to policy and programmes (The Gerontological Society of America 2020). Gerontology requires a multidisciplinary perspective to address multidimensional problems in older age. Frank (1946), in his opening article for the first issue of the Journal of Gerontology, compares gerontology to clinical medicine. Like clinical medicine, gerontology must recognise the individual as a biological organism and use knowledge from all the medical and biological sciences to treat them, whilst also recognising that each individual has their own life experiences, personality, emotions, and social and familial environments that are as much a part of the person as their organ systems and functional activities. To encompass these complexities, and adequately conceptualise ageing, gerontology must rely upon the contributions of many professions (Frank 1946).

Given the health implications of older age, a branch of gerontology named 'geriatrics' was coined to specifically focus on the health and medical care and treatment of older adults (University of Georgia: Institute of Gerontology 2020). Both gerontology and geriatric research aims to understand ageing so that older adults can be supported to age well. As such, both the science of gerontology and geriatrics have evolved as life expectancy has increased (University of Georgia: Institute of Gerontology 2020). With these developments the meaning of what it is to age well has changed too.

In this chapter the nature and role of geriatric care is presented, particularly in inpatient acute hospital settings (Section 2.2). Following this the progression of geriatric research is discussed (Section 2.3), and how the findings of resilience research are beginning to be applied to clinical practice is explored (Section 2.3.4.4).

2.2 Geriatric care in Medicine of the Elderly wards

2.2.1 The nature of geriatric care

The process of ageing brings about changes that can cause older adults to display different symptoms of illness in comparison to younger adults, and to respond differently to treatments and therapies (NHS England 2020a). In order to cater to the health needs of this population, MDTs work together to provide holistic and patient-centred care (Royal College of Physicians (RCP) 2020). Geriatric care is concerned with all aspects of health and illness in older adults and goals for geriatric care frequently include: prolonging life, improving or maintaining functional capacity (both cognitive and physical), independence and quality of life, and reducing pain and hospitalisation (Bell et al. 2016).

According to the RCP (2020) geriatric medicine is the largest medical specialty, and geriatric care can be provided in a variety of hospital and community settings. These include outpatient departments, emergency departments, medical assessment units, acute care wards, rehabilitation wards, day-care centres, care homes, and hospices (NHS England 2020a).

It is broadly understood that geriatric care is provided to older adults aged 65 years or older (Adhiyaman 2017; NHS England 2020b). However, there is no 'typical' older person, and some 80-year-olds will have better physical health than many 60-year-olds (WHO 2018). Additionally, the perceived start of old age varies across countries (Mortimer and Green 2015; Adhiyaman 2017), and the onset of geriatric syndromes (i.e. dementia, frailty, incontinence, and falls (Health in Ageing 2017; WHO 2018)) may begin earlier than 65. Accordingly, the RCP (2020) states that there is no defined age at which geriatric care becomes appropriate and there is a call to define 'older adults' not by chronological age but by their level of 'frailty' (Adhivaman 2017). It is suggested that this would enable individuals to receive the care they require, regardless of whether they are younger than 65 but have a geriatric syndrome or are 80 but are not frail (RCP 2020).

2.2.2 Medicine of the Elderly wards

The difficulty in determining when 'old age' starts translates into every geriatric care setting. In some settings, such as inpatient hospitals, criteria to determine who is eligible for admission into a MoE ward are often implemented.

According to NHS England, adults who are aged 65 or older and are admitted to hospital with a geriatric syndrome are suitable for admission to a MoE ward (Lyndon et al. 2014). Accordingly, Baxter et al. (2018) defined MoE wards as wards which provide 24-hour, acute, medical care for elderly patients (>65 years) with dedicated MDTs, and patient stays typically exceeding 48 hours. Besdine (2019), an American geriatrician, also recognises that an age greater than 65 is generally used to denote that an individual is appropriate for geriatric care.

However, these criteria do not result in all individuals aged 65 or older being admitted to MoE wards. Older adults who are admitted to hospital can be loosely placed into one of two groups; those who are fitter and present with simpler, single-organ pathologies, and those who present with more complex geriatric syndromes (Romero-Ortuno and O'Shea 2013). The latter generally require more complex hospital care due to multimorbidity, multicausality, high risk of adverse outcomes, and the need for specially-tailored care plans (Olde and Gussekloo 2014). It is the latter group that require comprehensive geriatric assessment (CGA) in a dedicated inpatient multidisciplinary ward (Sabbaghi et al. 2018).

As the healthy life expectancy of older adults increases, the age at which individuals require geriatric care also increases. Besdine (2019) explains that 'most people do not need geriatric expertise in their care until age 70, 75, or even 80'. This is echoed in the findings of Sabbaghi et al. (2018) who found that the mean age of adults deemed appropriate for admission into a MoE ward was 84 years old, and that these older adults were generally frailer and more likely to be cognitively impaired than older adults who received care in a general medical ward.

CGA is recognised as the gold standard for the management of frailty in older people (Clegg et al. 2013; British Geriatrics Society (BGS) 2018), and involves a holistic, multidisciplinary assessment of an individual, enabling personalised care plans to be put in place to support the older adult's individual needs and goals (BGS 2018). Research suggests that older adults who appropriately receive CGA experience better outcomes both during and after hospital admission. These outcomes include: a shorter length of hospital stay (Asplund et al. 2000), reduced cognitive and functional decline (Ellis et al. 2011), lower in-hospital mortality (Ellis et al. 2011), and a higher likelihood of being discharged straight home (Asplund et al. 2000) and still living there three to 12 months after discharge (Ellis et al. 2017). However, a later meta-analysis of CGA outcomes found that on average CGA costs £234 more than 'usual care'. Furthermore it found that CGA did not have a significant effect on mortality at three

to 12 months following discharge, and had little to no difference in dependence or cognitive function at follow-up (Ellis et al. 2017).

Geriatric care has experienced an exponential growth over the past four decades. This has paved the way for the creation of a new body of scientific knowledge to guide the clinical care of older persons, and provide a foundation for future research (American Geriatrics Society 2005). Today geriatric care continues to be underpinned by research in the field of gerontology and geriatrics. However it is recognised that the knowledge base for geriatric care needs to expand, especially regarding the needs of frail older adults (American Geriatrics Society 2005). This need for further research is demonstrated by some meta-analyses of geriatric studies, which are underpowered due to a lack of evidence (e.g. Ellis et al. 2017).

Nevertheless, geriatric research has provided insights into the heterogeneity of ageing, and various approaches to measure this and incorporate this knowledge into clinical practice have been given prominence over the years (American Geriatrics Society 2005). In the following section the changes in these fields of research are discussed, before looking at how they have been applied to geriatric care provision.

2.3 Developments in geriatric research

2.3.1 Successful Ageing

Traditionally geriatric research used chronological age to group individuals, the 'norms' for each age group were then used to examine the changes in older adults as they aged (Frank 1946). The general focus of geriatric research at this time was on losses, and while these methods produced statistically valid results, they failed to account for the variation in the health and functioning of individuals of the same age (Frank 1946).

It was in this era that Rowe and Kahn (1987) transformed the study of ageing from a discipline focused on disease and decline to one emphasising health and growth (Pruncho and Carr 2017). They achieved this through differentiating between 'normal ageing' and SA. Normal ageing was characterised by a high risk of disease and disability, though individuals would generally be able to function relatively well despite this. In contrast, SA was characterised by freedom from disability along with high cognitive, physical, and social functioning, demonstrating significant heterogeneity from the 'normal' health trajectories of old age

(Rowe and Kahn 1987). In other words, older adults whose performance was like that of younger adults were considered to be 'successfully ageing' (Hochhalter et al. 2011).

This traditional view of SA reflects a unidimensional, biomedical, and physiological view of later life. While it supported further research investigating alternatives to gradual deterioration in health in later life (Cosco et al. 2014), it is argued that it also projects the physical health of a younger adult as the norm in old age (Harper 1997). Consequently, SA sets a standard impossible to achieve by older adults who have any form of impairment or ill health (Harper 1997). Psychosocial theorists, believing that the traditional view of SA was unrealistic and unachievable, started to emphasise the need for measures of life satisfaction, well-being, social engagement, and personal resources to also be used as measures of SA (Cosco et al. 2014).

Consequently, two conceptualisations of biomedical and psychosocial SA have been developed. This has resulted in the development of many different definitions of SA. Each demonstrate a different opinion as to which components are essential to the definition of SA (Depp and Jeste 2006; Cosco et al. 2014).

The majority of studies which investigate SA use health measures structured around the model of Rowe and Kahn (Hornby-Turner et al. 2017). Accordingly focus is placed on biomedical characteristics, with physiological constructs (such as the absence of physical impairment) receiving more attention than the absence of cognitive impairments (Depp and Jeste 2006; Cosco et al. 2014). Still, many definitions also include components such as subjective health, social functioning and engagement, and personality resources and characteristics (e.g. resilience) (Depp and Jeste 2006; Cosco et al. 2014), reflecting the more holistic view of SA promoted by psychosocial theorists. In addition, others have argued against the objective assessment of SA, contending that only older adults can rate the extent to which they are successfully ageing (Pruchno et al. 2015). As a result of these debates a consensus definition of SA has not emerged (Depp and Jeste 2006; Cosco et al. 2014).

One consequence of the multiple definitions of SA is that there is significant variation in the proportions of successfully ageing older adults reported in the literature, with percentages being reported between 0.4% and 95% (Depp and Jeste 2006). This variation suggests that while one definition may label someone as successfully ageing another would not.

Regardless of definition, research into SA has primarily distinguished between positive and negative experiences of ageing, rooted in individual action (Holstein and Minkler 2003). Positive experiences are commendable and are used to identify traits which enable individuals to contribute to their continued good health. To quote Rowe and Kahn (1998, p. 12): 'We were trying to pinpoint the many factors that conspire to put one octogenarian on cross-country skis and another in a wheelchair'. Research into SA has provided strong evidence to suggest that various factors are associated with SA in community-dwelling older populations. These include: having good self-rated health, life satisfaction, psychological well-being and cognitive functioning, having strong social networks, the ability to engage in meaningful activities and a lack of physical and mental health problems, and being 'young-old' (Depp and Jeste 2006; Hornby-Turner et al. 2017).

However, Holstein and Minkler (2003) recognise several problems with Rowe and Kahn's aim. Firstly, it implies that if the disabled older-adult had tried hard enough they would have been able to ski, and secondly, it fails to take into account contextual features, such as the whether the '80-year-old skier had country club privileges and a winter home in Colorado' (p. 792). Furthermore, the suggestion that older adults can govern their own health omits factors such as genetics, traumatic accidents, or the implications of marginalisation (Holstein and Minkler 2003).

As stated, the traditional view of SA makes older adults who have comparable health to someone younger than them the baseline (Harper 1997). Consequently, frailty and disability are reflections of failure (Holstein and Minkler 2003). Newer conceptualisations of SA, which take into account psychosocial factors, provide a more holistic view of SA and are more closely aligned to older adults' perceptions of the concept (Hochhalter et al. 2011). However, these still tend to prioritise physiological health (Depp and Jeste 2006; Cosco et al. 2014). Consequently, there is still limited applicability of the concept of SA to older adults experiencing serious ill health or disability. This is reflected by the very small number of studies which recruit participants from clinical samples, or samples with health conditions, who would traditionally be deemed unable to successfully age (Cosco et al. 2014).

Furthermore, interventions aiming to promote SA would not only contribute to an extended number of years spent in good health, but also to longer life expectancy and consequently to a greater number of years spend in poor health (Tesch-Römer and Wahl 2017). Consequently, recommendations built upon the concept of SA will not eliminate

multimorbidity, frailty, and care needs altogether, but merely postpone them, causing the prevalence of older people with care needs to remain both stable and substantial (Tesch-Römer and Wahl 2017).

2.3.2 Healthy ageing

The concept of SA was developed in order to promote the highest possible quality of life in old age through the identification of protective factors and the development of effective intervention strategies (Tesch-Römer and Wahl 2017). These priorities continue to be an important focus for ageing research and practice, particularly for research investigating health behaviour in old age (McKee & Schüz, 2015).

However, models of SA are criticised as being exclusionary, for inadequately capturing essential features of old age, such as age-related losses, and for disregarding older adults' subjective constructions of what it means to age well (Martinson and Berridge 2015). Consequently, research shows a large discrepancy between healthcare providers' and older adults' perceptions of what it means to successfully age. This is demonstrated by Strawbridge et al.'s (2002) study which found that 50.3% of their older adult participants rated themselves as successfully ageing, though by Rowe and Kahn's definition only 18.8% were deemed to be successfully ageing. Strawbridge et al.'s (2002) results do not suggest that physical health and functioning are not important components of SA, as the proportion of those who said they were ageing successfully declined as the number of prevalent chronic conditions and functional difficulties increased. However, they do indicate that traditional SA criteria do not wholly explain older adults' perceptions of what it is to age well (Strawbridge et al. 2002).

Healthy ageing is a concept closely related to SA, in that it captures the essence of physical and cognitive functional preservation, however, it does not include the requirement of freedom from disease and disability (Wong 2018). Instead, healthy ageing is determined by a level of health and adaptation to the ageing process acceptable to the individual (Bryant et al. 2001). Healthy ageing is therefore a more inclusive concept and one that more accurately describes the subjective and objective experiences of older adults as they age (Wong 2018).

The WHO (2015, p. 41) defines healthy ageing as 'the process of developing and maintaining the functional ability that enables well-being in older age' with functional ability referring to 'the health-related attributes that enable people to be and do what they have reason to value' (WHO 2015, p. 41). It is further stated that 'healthy ageing is more than just the absence of disease' (WHO 2015). Despite this, there is still some concern amongst researchers that this definition of healthy ageing placed emphasis on an individual's functional ability, which is influenced by illness, disease or accident, and, consequently, could medicalise the concept of healthy ageing (Fernández-Ballesteros et al. 2017).

However, in 2020, the WHO clearly stated that 'functional ability' is made up of both the intrinsic capacity of an individual, relevant environmental characteristics, and the interaction between them. Importantly, it was recognised that the ability to live in physical and social environments which support and maintain intrinsic capacity and functional ability is key to healthy ageing (WHO 2020).

In view of this, the creation of age-friendly environments, which are characterised as being accessible, safe, secure, equitable, and inclusive (WHO 2007), and age-friendly health systems, which focus on preventative care, are understood to provide an essential foundation for healthy ageing (Wong 2018). Consequently, it is suggested that by focusing on healthy ageing older adults will be supported to 'age in place', regardless of age, ethnicity, income, or functional ability level, and the number of years an older adult spends in good health can be extended (WHO 2007; Wong 2018).

The World Health Organisation also suggest that around 75% of the diversity observed in older adults' capacity and circumstances is the result of the cumulative impact of advantage and disadvantage across people's lives (WHO 2020). This protects healthy ageing from receiving the same critique as SA, that it ignores the impact of contextual factors (Holstein and Minkler 2003).

The recognition that healthy ageing is influenced by both individual and environmental factors, and is not reliant on the absence of limitations, also means that healthy ageing, unlike SA, is an achievable experience for all older adults (WHO 2020). However, while models of healthy ageing have developed to become more multidimensional and holistic, models of geriatric care, which underpin the provision of care in clinical settings, continue to remain more medical and focus on identifying geriatric syndromes which increase the

risk of negative health outcomes (Capezuti et al. 2011). Accordingly, many models of geriatric care focus on measuring an older adult's 'intrinsic capacity', the composite of their physical and cognitive capacities, to determine whether an older adult is experiencing healthy ageing (Belloni and Cesari 2019). In clinical practice this can be seen in the routine assessment of older adults' frailty (WHO 2017; Belloni and Cesari 2019).

2.3.3 Frailty

'Frailty' is a clinically recognised state of increased vulnerability resulting from a decline in the body's physical and psychological reserves and the outcomes of multiple long-term conditions (Lyndon 2015; BGS 2018). Frailty is often investigated in clinical settings as multinational guidance recommends that any interaction between an older person and a health professional should include an assessment of frailty (Dent et al. 2019). However, despite this guidance, frailty is more likely to be identified in inpatient settings as, in the community, a focus on controlling long-term conditions such as diabetes or heart failure means that frailty is more likely to be overlooked (BGS 2018).

The proportion of frail older adults varies across studies. In America the prevalence of frailty in community-dwelling older adults aged 65+ is predicted to be around 7% to 12%; in European countries the proportion is believed to be around 17%, while in Latin American cities prevalence of frailty varied from 21% to 48% (Xue 2011). For individuals over the age of 85 it is estimated that between 25% and 50% may be classed as frail (Clegg et al. 2013). Research also suggests that frailty is more prevalent in women than men (Clegg et al. 2013).

For the large proportion of older adults with frailty the negative implications of frailty on their health and functioning will be progressive (Xue 2011). Accordingly, frailty is understood as a continuum of severity, with frailty measures using grading systems (e.g. the Clinical Frailty Scale developed by Rockwood et al. (2005)) and several studies identifying that older adults can also be classed as pre-frail (e.g. Hanlon et al. 2018; Kidd et al. 2019; Gordon et al. 2020). As frailty increases the risk of a dramatic deterioration in older adults' physical and mental well-being after a relatively 'minor' health problem (e.g. a urinary tract infection) also increases (Clegg et al. 2013; BGS 2018; Dent et al. 2019). This can be seen in the adverse outcomes of individuals with frailty, which include an increased likelihood of unmet care needs, worsening disability, falls, fractures, hospitalisations, care home admissions, lower quality of life, and death (Clegg et al 2013; Dent et al. 2019).

2.3.3.1 Frailty: assessment and intervention

Longitudinal studies have identified that frailty is dynamic, and multiple studies have found that around a third of frailty transitions are from a state of greater frailty to a state of lesser frailty (Bandeen-Roche et al. 2006; Gill et al. 2006). These findings suggest that frailty is not an irreversible process. However, it is advised that the onset of frailty needs to be identified sharply, before symptoms such as weight loss appear, for frailty interventions to be successful (Clegg et al. 2013).

In view of this, frailty screening measures have been developed for use in clinical care settings to try and determine whether an older adult needs specialist geriatric care and would benefit from CGA (Dent et al. 2019). These frailty measures are constructed according to one of two broad models of frailty; either the phenotype model or the cumulative deficit model (Clegg et al. 2013).

The phenotype model is based on the work of Fried et al. (2001) who proposed that three of the following five criteria indicate frailty: low grip strength, low energy, slowed walking speed, low physical activity, and unintentional weight loss. According to the findings of two large-scale cohort studies the first observed physical component of frailty is most commonly exhaustion and weakness, followed by reduced mobility and lower physical activity, while weight loss tends to develop last (Xue 2011; Stenholm et al. 2019). In 2018, the BGS updated the five 'frailty syndromes', and suggested that falls, immobility, delirium, incontinence, and susceptibility to side effects of medication indicate an individual has frailty (BGS 2018).

One frailty screening measure based on the phenotype model is the Health Improvement Scotland 'Think Frailty Screening Tool', which asks whether patients have a functional impairment, acute condition, immobility or falls, polypharmacy or are a resident in a care home, to identify individuals who would benefit from CGA (Health Improvement Scotland 2014). A positive answer on any one question is assumed to be indicative of frailty.

However, identifying frailty can be difficult; an individual may demonstrate reduced mobility due to a progression in knee arthritis and therefore score positively for frailty, but still be able to live an independent and healthy life, albeit a little slower (BGS 2018). Consequently, more structured frailty measures have been developed to indicate frailty based on a more complete clinical picture. These are based on a cumulative deficit model of frailty, and often assess frailty using risk indices, counting the number of deficits accumulated over time (Xue 2011). While this approach is more challenging due to the higher number of variables needed

to assess frailty, a cumulative deficit frailty measure is a more sensitive assessment for frailty, when compared to measures based on the phenotype model, and more accurately predicts adverse health outcomes due to its finer-graded scale and multidimensionality (Rockwood et al. 2007).

Two examples of cumulative deficit-based frailty measures are the Edmonton Frail Scale (EFS) and the Clinical Frailty Scale (CFS). The Edmonton Frail Scale assesses frailty based on nine domains: cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence and functional performance (measured using a Timed Up & Go test) (Rolfson et al. 2006). Similarly, the CFS consists of a seven-point scale encompassing a broad assessment of frailty based on the clinical health and performance abilities of the older adult (Rockwood et al. 2005).

It is recommended that specific frailty measures are best suited for particular purposes or care settings. For example, several frailty measures include a physical performance–based test, which may reduce a scale's practicality in clinical settings as many older adults will be unable to complete them safely (Hoogendijk et al. 2013). Frailty measures which include a physical test (e.g. the EFS) may, therefore, be better suited to research assessing the prevalence of frailty in a general population of independent and community-dwelling older adults, while frailty measures which do not include a physical test (e.g. the CFS) may be better suited for safely assessing frailty in acutely unwell older adults admitted to a hospital ward. Furthermore, frailty measures which do not include a physical measure are often quicker to complete (the CFS takes five minutes to complete (CGA Toolkit 2020a) as opposed to the 20 minutes required to complete the EFS (CGA Toolkit 2020b)), this brevity may also make these measures more appropriate for assessing frailty in a fast-paced clinical care setting.

However, while frailty measures have been developed for use in clinical care, it has been found that there is currently a lack of robust evidence which supports routine frailty identification as a way to improve clinical care in older populations (Dent et al. 2019). In their critical review of the evidence base behind both individual and health-care system frailty interventions, Dent et al. (2019) concluded that frailty screening may have no influence on medical decision-making regarding patient management and that while the limited evidence suggests frailty interventions may improve patient outcomes, the certainty of evidence is low (Dent et al. 2019). It is proposed that this may be due to the resource-intensive nature of CGA that makes it inefficient in routine inpatient care (Clegg et al. 2013).

2.3.3.2 Frailty Identity Crisis

Frailty is often considered in relation to its implications on older adults' physical health. Yet, on the back of traditional societal values structured around SA which emphasises the importance of youthful health and independence, the transition from independence to frailty may have a significant psychological implication on older adults (Fillit and Butler 2009). Accordingly, research has found that increasing frailty impairs the psychological well-being of older adults (Andrew et al. 2012, McDougall and Balyer 1998), and suggests that implications of the ageing process and frailty (e.g. medical comorbidities, fatigue) may change an individual's perception of themselves, and cause them to start identifying as an 'old person' (Butler 1967).

The term 'frailty identity crisis' has been proposed as a descriptor for the maladaptive response of the sense of self as health deficits accumulate and frailty increases (Fillit and Butler 2009). It is also proposed that a major life event which significantly affects psychological well-being may result in maladaptive dependence, causing the onset of disability and predisposition to frailty (Fillit and Butler 2009). While the concept of a frailty identity crisis is relatively new and lacks a well-established operationalisation, recent empirical research has supported its proposal (Andrews et al. 2012). In a sample of community-dwelling older adults, Andrews et al. (2012) found that frailty and psychological well-being were strongly correlated, even after controlling for self-reported mental health, thus supporting the suggestion that increased frailty leads to worsened well-being. Furthermore, frailty was not found to be associated with autonomy (which was framed as being self-determined and not easily influenced, and having confidence in one's own opinions) (Andrews et al. 2012). It was suggested that this finding also supports the idea of a frailty identity crisis as personality characteristics are less likely to be influenced by increasing frailty (Andrews et al. 2012).

To prevent a frailty identity crisis an older adult must psychologically and emotionally adapt to the loss of physical independence. Therefore, care management plans should include the individual's preferences and priorities and focus on the maintenance of psychological health in the face of declining function and increasing adversity (Fillit and Butler 2009; Dent et al. 2019).

The concept of resilience, which is briefly addressed in the following section and discussed more thoroughly in the subsequent chapter, has been promoted as the process by which

older adults successfully adapt to the adversities and limitations associated with old age (Whitson et al. 2018).

2.3.4 Resilience

Historically, approaches to the promotion of health have been based on an 'illness model', which focuses on risk factors and health deficits, rather than those associated with improving health status (Hornby-Turner et al. 2017). Consequently, geriatric research has previously focused on the negative implications of disease and disability (Lau et al. 2010). While this approach is useful for understanding specific needs and priorities, it tends to define individuals in negative terms (Hornby-Turner et al. 2017). In contrast a 'wellness' approach is now receiving increased attention within geriatric research. 'Wellness models' are concerned with identifying protective factors to support health and an individual's sense of well-being (Hornby-Turner et al. 2017).

Though the concepts of SA and frailty have been influential in the development of geriatric research, both lend themselves to being focused on the negative implications of ageing. While SA looks for characteristics which enable individuals to have good health, the definition of SA sets a standard impossible to achieve by most older adults and makes frailty and disability reflections of failure (Holstein and Minkler 2003). The concept of frailty recognises that the process of ageing causes declines in the body's physical and psychological reserves causing increased vulnerability, though also recognises that there is a spectrum of frailty and that increased frailty doesn't have to detract from the older adult's quality of life (Fillit and Butler 2009). However, both methods of assessing frailty focus on its associated deficits, as such frailty measures still attempt to assess a negative concept (Witham and Sayer 2015). Though these measures are useful, particularly in trying to identify individuals at risk of negative outcomes, models focused on illness are generally ill-equipped to provide a basis for comprehensive intervention (Witham and Sayer 2015).

Accordingly, Fillit and Butler (2009) suggest that the perception of frailty and SA needs to change, so that models of ageing recognise an individual's enduring value, and ability to maintain a good quality of life, and so that old age characterised by robust physical health is not the only one perceived as a 'life worth living'. In view of this, it has been suggested that the concepts of healthy ageing and resilience should be focuses of geriatric research.

In comparison to SA, the concept of healthy ageing offers a more holistic and multidimensional understanding of the ageing process (Wong 2018). Additionally, the concept of healthy ageing recognises that both individual and environmental factors influence an older adult's ability to experience well-being in older age, and it is argued that healthy ageing is attainable for all older adults if they live within age-friendly environments (WHO 2015; 2020). However, it is suggested that models of healthy ageing would be further strengthened through the addition of resilience and adversity (Cosco et al. 2017).

In view of this, it has been suggested that the concept of resilience should also be a focus of research, as it is understood to support an individual's well-being, as well as contribute towards active engagement and independence, and, therefore, may reduce the negative outcomes associated with age-related adversities (e.g. frailty) (Kuh and the New Dynamics of Ageing Preparatory Network 2007; Rebagliati et al. 2016; Whitson et al. 2018).

Resilience is defined as the process by which individuals effectively adapt to and manage adversity, and is an important factor in the maintenance of health and well-being (Windle 2011). Accordingly, examining resilience provides greater opportunity to acknowledge the ways in which older adults thrive in spite of, and sometimes because of, their experiences with adversity (Wild et al. 2013). Based on a wellness model resilience research also focuses on the protective factors of older adults' resilience, and therefore provides more comprehensive foundations for the development of interventions (Witham and Sayer 2015). Resilience is also understood to contribute to the knowledge developed by research into SA, healthy ageing, and frailty.

2.3.4.1 Resilience and successful ageing

The processes by which SA is achieved are not fully understood, though a number of individual characteristics and personality traits are believed to contribute to the successful adaptation of older adults to the challenges and changes associated with ageing (Hochhalter et al. 2011). One such characteristic is resilience.

A potential outcome of resilience is positive adaptation (Earvolino-Ramirez 2007), which 'occurs when an individual is rebounding or recovering from a disruptive or adverse event and the recovery is beneficial or effective' (Earvolino-Ramirez 2007). Therefore, effective assessment of resilience may support researchers to distinguish between those who show 'usual' responses to adversity from those who are particularly adaptive (Hochhalter et al.

2011), and has the potential to explain why some older adults successfully age while others do not (Pruchno and Carr 2017).

However, the concept of resilience is not subject to the same 'exclusionary' criticism as SA - that it is unachievable for many older adults (Pruchno et al. 2015). This is because resilience is not solely about achieving a superior level of functioning, but is about returning to 'normal' following adversity or doing 'better than expected' through 'ordinary' processes (Windle 2012; Wild et al. 2013). Consequently, not all resilient individuals are successfully ageing, and resilience is understood to be a goal that can be nurtured and achieved by all, including older adults experiencing ill health and stressful life events (Pruchno et al. 2015). This makes resilience an appropriate foundation for the development of interventions, and focus for geriatric research (Harris 2008; Hochhalter et al. 2011; Pruchno and Carr 2017). This is markedly different from SA research, in which adversity has not played a central role (Pruchno and Carr 2017), and it is for this reason that a growing number of geriatricians have argued that resilient ageing should become the dominant paradigm for ageing well (Fullen and Gorby 2016).

In consideration of this, Pruchno et al. (2015) propose that SA is best thought of as a pattern of resilience across the lifespan and multiple adversities. Though this deviates from the definition of SA proposed by Rowe and Kahn (1987), it is consistent with the understanding that patterns of ageing are distinct and unique (Pruchno et al. 2015). Furthermore, it lends itself to clinical care as it allows individuals living with physical health problems to be defined as ageing successfully (Pruchno et al. 2015). Hochhalter et al. (2011) support this as they suggest that in place of SA, resilience should be considered across psychological, physiological, environmental, and social domains to support the health of older adults. Considering resilience across these domains further differentiates it from SA, as SA is criticised for ignoring the impact of the social and physical environment on older adults' well-being and for differing from older adults' perception of 'optimum ageing', which values compensation (support from the physical environment), contribution (having a positive impact on their environment), connection (meaningful social interactions), and challenge (opportunities for stimulation) (Stephens et al. 2015).

Consequently, resilience not only has the potential to build upon traditional SA research (Hochhalter et al. 2011), but also offers a more inclusive view of SA that can be applied to older adults experiencing the unavoidable challenges of ageing (Pruchno and Carr 2017).

2.3.4.2 Resilience and healthy ageing

In view of research that found that older adults define their health according to their ability to participate in meaningful activity, and in consideration of the criticisms of SA, models of healthy ageing were developed to provide a more multidimensional and holistic view of what it means to age well (Bryant et al. 2000; 2001). These traditional models of healthy ageing suggest that developing and maintaining functional ability is a requirement, with functional ability being determined by the interaction between the intrinsic capacity of an individual and relevant environmental characteristics (WHO 2015). In comparison, the process of resilience is understood to be an interaction between the individual, the environment, and the adversity (Johnson and Wiechelt 2004; Wild et al. 2013), and resilience theory stipulates that it is through navigating adversity and maintaining functional ability that individuals demonstrate resilience (Aburn et al. 2016).

It is proposed that the concept of resilience may strengthen understanding of healthy ageing, as through the addition of adversity and resilience to the healthy ageing model, the concept becomes much more appropriate for the ageing population who are likely to experience both medical and non-medical adversities (Cosco et al. 2017), such as bereavement, retirement, and ill health (Hardy et al. 2002). Furthermore, the relationship between health and occupational participation may be indicative of resilience being a key feature of healthy ageing, as resilience is understood to be promoted when individuals have the ability to control their participation in meaningful activity (Rutter 1993).

Both models of healthy ageing and models of resilience seek to identify factors that support the health and well-being of older adults (Fullen and Gorby 2016; Hornby-Turner et al. 2017). However, neither is reliant on the absence of ill health or limitations (Bryant et al. 2001; Hicks and Conner 2014). Instead, healthy ageing is determined by an older adult's ability to do the things they value, and whether their level of health and adaptation to the ageing process is acceptable to the individual (Bryant et al. 2001; WHO 2015), while perceived quality of life is generally regarded as the primary outcome of resilience (Hicks and Conner 2014).

Despite this, there is some concern that the application of healthy ageing recommendations into clinical practice has continued to focus upon older adults' individual characteristics and intrinsic capabilities, rather than the effect of their environment (Fernández-Ballesteros et al. 2017; Belloni and Cesari 2019). Comprehensive assessment of

the process of resilience would develop greater understanding of the influence of environmental factors on older adults' quality of life and life satisfaction (Johnson and Wiechelt 2004; Wild et al. 2013). Investigation of resilience may also support the creation of age-friendly environments and health systems, which are understood to be crucial for the process of healthy ageing (Wong 2018), through identifying social and community factors which support an individual's ability to adapt well in the face of age-related adversities (Earvolino-Ramirez 2007; Hicks and Conner 2014; Hayman et al. 2017).

Finally, research into resilience may help to explain why some older adults with no medical conditions consider themselves to be ageing poorly, while others with multiple conditions feel they are experiencing healthy ageing. Understanding this inconsistency may provide insights into how to promote quality, as well as quantity of life, in the face of age-related adversities, such as frailty (Strawbridge et al. 2002).

2.3.4.3 Resilience and frailty

Frailty is common in older adults and has received a lot of attention in geriatric care as it suggests that an individual is vulnerable to stressors. Measurements of frailty use a static approach to determine an individual's health and functioning at a particular time (Gijzel et al. 2017). While these measurements are useful, it is recognised that the capacity to cope with challenges is not static but dynamic (Gijzel et al. 2017). Resilience is proposed as the dynamic capacity of an individual to cope with stress and regain health through adaptation (Gijzel et al. 2017).

The relationship between resilience and frailty has been investigated in multiple studies, as it is suggested that resilience is associated with frailty as it enables the older adult to adapt to their increased vulnerability (Freitag and Schmidt 2016). Previous research supports this suggestion as resilience has been found to significantly associate with frailty (e.g. Freitag and Schmidt 2016; Gijzel et al. 2017) and interact with frailty when determining the functional outcome of older adults at discharge from acute hospital (Rebagliati et al. 2016). Moreover, there is a consensus that resilience and frailty are not two ends of the same spectrum, an older adult could exhibit both characteristics, either, or none (DeAlfieri et al. 2011; Witham and Sayer 2015).

However, there is some debate as to the place of frailty and resilience in research. While Witham and Sayer (2015) suggest that resilience may be a 'step beyond frailty', the general consensus is that frailty and resilience should be considered together, as both recognise that

the response of individuals to adverse health conditions is dynamic and varies significantly (Rockwood and Mitnitiski 2015). De Alfieri et al. (2011) suggests that frailty is an appropriate topic for gerontological research, which aims to study ageing and the decline of 'homeostatic reserves', while resilience should be an interest of geriatric research as identifying protective factors of resilience could support the development of interventions and improve patient outcomes (De Alfieri et al. 2011; Gijzel et al. 2017).

Regardless of whether researchers share the opinion that frailty and resilience should be investigated in tandem, or whether they should be considered separately, geriatric research into resilience has grown, as it may aid complex decision-making in the healthcare of older adults (De Alfieri et al. 2011).

2.3.4.4 Resilience in clinical practice

Recognised by the concept of frailty, older adults are at increased risk of developing multiple chronic conditions, otherwise known as multimorbidity (Fabbri et al. 2015). Multimorbidity increases the risk of hospital admission and readmission, which can reflect tipping points and critical transitions in older adults' well-being (Martin 2016).

In the face of multimorbidity, resilient older adults are able to experience growth despite illness as they can focus on emotional, social, cultural, and spiritual components of resilience not just the physical (Wister et al. 2016). This enables the individual to redefine their own well-being so that in the face of ill health they still perceive themselves to be well (Wister et al. 2016). This is observed in the findings of Ong et al. (2014) who found that many individuals with multimorbidity do not identify themselves as being unwell, and were able to maintain their resilience through their social roles, adapting these roles when required. In population-based studies research has also found that greater resilience is associated with fewer depressive symptoms when ill health is a threat, moderates the relationship between ill health and subjective well-being, and protects against functional disability during chronic illness (Windle et al. 2010; Gallacher et al. 2012; Bauer et al. 2016; Manning et al. 2016).

Nevertheless, while it is understood that cultivating and maintaining resilience is fundamental to functioning and quality of life for those experiencing ill health or living with multimorbidity (Wister et al. 2016), it is also recognised that resilience resources and processes tend to become less common as vulnerability factors and adversities increase, and outcomes worsen (Liebenberg and Moore 2018). Consequently, a negative correlation has been found between an individual's resilience (indicated by a greater number of cumulative

adversities and low mastery scores) and the frequency with which they see a doctor or are admitted to hospital (Ezeamama et al. 2016). Further research has also found that resilience is negatively affected by disease duration, suggesting that the longer an older adult lives with a condition the larger the impact it has on their resilience (Böell et al. 2016).

Given the various biopsychosocial influences on older adults' resilience, an individual's response to the demands of a stressful event must be considered by all clinical professionals (Lopez 2011). Accordingly, resilience research has made recommendations for a variety of clinical professions, and multidisciplinary approaches to resilience interventions for older adults are often advised.

Research into multidisciplinary resilience interventions has tended to investigate the benefits of group-based interventions, which provide individuals with the opportunity to reframe their past experiences to identify how they have previously bounced back from adversity. It is proposed that through this, individuals are able to identify their own resilience resources, make meaning from their current situations, and target practices which will help enhance resilience (Fine 1991; Fullen and Gorby 2016; Sadler et al. 2017). These interventions have been proved effective in increasing the resilience and emotional and physical well-being of older adults (Fullen and Gorby 2016), and echo the understanding that resilience is not so much about what happens to the individual, but about how they interpret and explain it (Fine 1991).

For those working with older adults facing adversity, it is also important to recognise that resilience is not limited to what is inside the person. Resilient older adults are often highly adept at mutual interdependence, using others as a reserve. Healthcare professionals should reinforce this ability through supporting the belief that a reasonable degree of dependence is acceptable (Rosowsky 2009).

It has also been suggested that occupational therapists may play a crucial role in promoting resilience, as it has been recognised that the mental well-being of older adults is associated with participation in meaningful activities and independence (NICE 2008), and that resilience is fostered when an individual has control over their participation and how it is shaped within their life (Rutter 1993). In the face of adversity, occupational therapists aim to facilitate occupational adaptation so that individuals are able to retain their ability to participate in their chosen activities (Kielhofner 2007; Lopez 2011). In order to achieve this, occupational therapists consider the holistic nature of the person, considering both individual and

environmental characteristics (Lopez 2011). This is particularly beneficial for resilience interventions, as resilience is understood to be affected by individual, social and community resources (Windle 2011). In light of this, research has found that holistic occupational therapy interventions, focused on community reintegration, functional performance, coping strategies, patient education, and symptom management are effective in improving the resilience of patients living with multiple sclerosis (Falk-Kessler et al. 2012). However, there is currently no research investigating the impact that occupational therapy can have on older adults' resilience.

This is of concern as the role of resilience may have increased importance for older adults who are admitted to hospital. In the face of physical dysfunction, reduced involvement in activities of daily living (ADL), and uncertainty about the future, older adults demonstrate similar resilience to that of individuals with generalised anxiety disorder, implying a risk of poor adaptation (Liu et al. 2018). For this reason, occupational therapists are important for promoting older adults' resilience during hospital admission, as the loss in engagement in ADL or valued occupations represents a change in the individual's occupational identity and occupational performance, which can lead to poor health and well-being (Law 2002).

Furthermore, around 30% to 40% of hospitalised older adults are discharged with a new, often persistent, disability that limits their involvement in ADL and increases their dependence on family members or care givers (Boyd et al. 2008; Covinsky et al. 2011). At discharge from hospital older adults with resilient qualities are more likely to be able to successfully adapt back to their home environment and the adversities that face them there (e.g. increased difficulty in performing ADL) (Esche and Tanner 2005). Resilience is therefore suggested as a key factor to consider when facilitating the transition from hospital to home, and it is suggested that by identifying the protective and vulnerability factors of older adults, targeted resilience interventions can be developed to facilitate a successful transition (Esche and Tanner 2005).

Despite the recognition that resilience interventions may be effective in improving health and well-being, systematic reviews of resilience interventions have found that it is difficult to assess the efficacy of resilience interventions. This is due to the varied use of resilience definitions and research methods, the large number of studies which assess improvement in resilience solely by a change in resilience scale scores, and the small number of peer-reviewed publications which promote resilience interventions in relation to health outcomes,

or the ability of an individual to adapt well to a future adversity (WHO 2002; Chmitorz et al. 2018; Joyce et al. 2018). However, in accordance with Esche and Tanner (2005), Kivnick and Murray (2001) propose that when adversities, vulnerability factors, and protective factors are identified health professionals and older adults are better equipped to strengthen resilient behaviours and facilitate resilient outcomes. In the following chapter the adversities, protective factors, and vulnerability factors of older adults are presented.

2.4 Conclusion

The field of gerontology is concerned with older adults and ageing (University of Georgia: Institute of Gerontology 2020). Geriatric research is a branch of gerontology that focuses on the medical care and treatment of older adults (University of Georgia: Institute of Gerontology 2020). This research underpins the provision of geriatric care which is concerned with all aspects of health and illness in older adults (Bell et al. 2016). Over the past four decades geriatric research and geriatric care has evolved from an emphasis on successful ageing, to more recent emphases on healthy ageing, frailty, and resilience (American Geriatrics Society 2005).

The concept of SA first transformed the study of ageing by shifting its focus from illness models to wellness models, which seek to identify protective factors that support health and well-being (Hornby-Turner et al. 2017; Pruncho and Carr 2017). However, critics of SA argue that it sets a standard unachievable for many older adults and makes ill health and disability, that often mark normal ageing, reflections of failure (Holstein and Minkler 2003; Pruchno et al. 2015). Consequently, there is very little SA research conducted in clinical settings.

Following SA, the concept of healthy ageing has developed the understanding of what it means to age well (Wong 2018). Recognising the influence of both individual and environmental factors on older adults' ability to be and do what they have reason to value (WHO 2020), the experience of healthy ageing is one that all older adults should be able to experience through the creation of age-friendly environments and health systems (Wong 2018). However, in clinical settings focus is often given to older adults' intrinsic capacity and frailty levels, in order to determine whether they are experiencing healthy ageing.

Understood as a continuum, frailty is the state of increased vulnerability resulting from the process of ageing, and its associated declines in health and functioning (Lyndon 2015; BGS 2018; Dent et al. 2019). It is understood that as frailty increases, the likelihood that a health problem will cause a reduction in older adults' well-being also increases (Clegg et al. 2013; BGS 2018; Dent et al. 2019). As such, frailty measures are routinely used to try and identify vulnerable older adults who would benefit from specialist geriatric care (Dent et al. 2019), though at present there is little evidence that frailty screening impacts medical decision-making or improves patient outcomes (Dent et al. 2019). It is proposed that this is partially because models of care focused on identifying ill health are not well suited as the basis for interventions (Witham and Sayer 2015).

Considering the critiques of SA, healthy ageing, and frailty, the concept of resilience has been proposed as an important focus for geriatric research. The concept of resilience is built upon a wellness model and helps to explain why some older adults thrive in the face of adversity and can maintain their well-being (Wild et al. 2013). Unlike SA, resilience is understood to be achievable by all, and in comparison to frailty, provides stronger foundations for the development of interventions through the identification of protective factors (Witham and Sayer 2015). Resilience is also proposed to contribute to the understanding of healthy ageing through the addition of adversity and resilience to the healthy ageing model (Cosco et al. 2017), and through the investigation of environmental factors which influence older adults' ability to adapt well in the face of adversity (Earvolino-Ramirez 2007; Hicks and Conner 2014; Hayman et al. 2017).

Concerning hospital care, it is suggested that through equipping individuals with the skills needed to withstand adversities they may face, resilience interventions may facilitate the successful transition from hospital to home (Esche and Tanner 2005). More generally, it is proposed that through the development of resilience interventions older adults' emotional and physical well-being may be supported (Fullen and Gorby 2016). Several researchers have advised that these resilience interventions rely on the identification of adversities, vulnerability factors, and protective factors (Kivnick and Murray 2001; Esche and Tanner 2005).

The following chapter focuses specifically on the conceptualisation of resilience and its development within geriatric research, before identifying the adversities, protective factors, and vulnerability factors of older adults.

Chapter 3 Resilience

3.1 Introduction

The American Psychological Association (2018) defines resilience as 'the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress'. Efforts to understand resilience are gaining popularity among geriatric researchers, who believe that it may hold the key to health improvement through enabling the identification of older adults who are likely, and those who may struggle, to 'bounce back' following health difficulties, thus supporting customised management and interventions (Hardy et al. 2004; Hicks and Conner 2014; Gijzel et al. 2017; Hayman et al. 2017).

The concept of resilience has developed from being understood as a stable personality trait, to being recognised as a dynamic process which all individuals are capable of achieving (Masten 2001; Hicks and Conner 2014). This chapter begins with an overview of the history of resilience research, the theory around the conceptualisation of resilience, and the measurement of resilience (Sections 3.2-3.4). Following this, it presents how conceptualisations of resilience have been translated into geriatric research (Section 3.5), seeking to identify common adversities among older adults (Section 3.5.2), their protective and vulnerability factors (Sections 3.5.3-3.5.4), and the outcomes of resilient individuals (Section 3.5.5).

3.2 History of resilience research

3.2.1 The three waves of resilience research

Over the past 40 years resilience research has gone through several stages. Originating in early psychological literature, resilience was first referred to as 'invulnerability' or 'invincibility' (Earvolino-Ramirez 2007) and research was concerned with identifying factors which enabled individuals, primarily children, to successfully adapt and flourish in the face of adversity (Tusaie and Dyer 2004; Luthar 2006).

In this context Werner and Smith (1982) conducted a longitudinal study of 505 infants who were born on the Island of Kauai in 1955, following their lives from birth until middle age.

Their findings revealed the radically different outcomes between individuals who had grown up in seemingly similar environments. Of the children who grew up in poverty or other adverse conditions (e.g. parental substance abuse, or mental ill health) two thirds demonstrated negative outcomes later in their lives (e.g. mental ill health), while the other third were more likely to become confident and capable adults (Werner and Smith 1982).

This study marked the beginning of resilience research (Earvolino-Ramirez 2007). Researchers sought to understand why outcomes following adverse life events differed amongst individuals' who shared common characteristics and experienced similar adversities. This characterised the first wave of resilience research: identification of resilient qualities (Richardson 2002). Research questions were focused on the identification of characteristics which marked people who thrived in the face of adversity and lists of factors which helped people overcome adversity were generated (Richardson 2002). It was through this research that psychologists began to recognise that resilience was influenced at the individual, social, and community level (Tusaie and Dyer 2004; Windle 2011).

Despite this, early definitions of resilience proposed that it was a personality trait for adapting and adjusting to adversity, thus sharing the same qualities of the 'invulnerable' or 'invincible' personality trait (Lee et al. 2013). However, findings cumulated as part of this first wave led to research which sought to understand the processes supporting the development of resilient qualities in individuals.

Flach (1988; 1997) suggested that resilient qualities were developed through successful reintegration following adversity. In 1990, Richardson proposed a resilience model which suggested that, following adversity, there were four types of reintegration: resilient reintegration, reintegration back to homeostasis, reintegration with loss, and dysfunctional reintegration. Resilient reintegration was understood to be characterised by growth in knowledge, self-understanding, and increased strength of resilient qualities (Richardson 2002). Richardson (2002) also noted that individual (i.e. related to personal capacity for resilience) and contextual (e.g. level of adversity) differences affect individuals' potential for resilient reintegration. The observed variation marked the first definition of resilience as a process (Richardson 2002).

The distinction between trait and process understandings of resilience has led to the use of varied terminology in literature. The concept of resilience as a personality trait is often referred to as 'ego-resilience', while the term 'resilience' is more commonly used to refer to

the dynamic process by which individuals adapt well following adversity (Lee et al. 2013). In comparison to the trait understanding of resilience, which would either deem an individual as resilient or not, the conceptualisation of resilience as a process recognises that resilience is supported or undermined by a dynamic interaction between individual characteristics, environmental resources, and the level of adversity (Luthar et al. 2000; Lee et al. 2013).

The third wave of resilience research developed from the belief that every individual has a form of innate resilience, an intrinsic motivational force which 'drives them to seek self-actualization, altruism, wisdom, and harmony with a spiritual source of strength' (Richardson 2002, p. 313). This 'force' then mediates the relationships between the person and the environment, and the person and the outcome, and drives them to resiliently reintegrate following adversity (Richardson 2002).

3.2.2 The current understanding of resilience

The conceptualisation of resilience as a dynamic process, influenced by the adversity, the individual, and the environment enables researchers to consider the ways that assets and resources support or inhibit an individual's ability to adapt and persevere in the face of adversity (Luthar et al. 2000; Johnson and Wiechelt 2004; Lee et al. 2013; Wild et al. 2013). Moreover, an individual's assets and resources are considered to be modifiable through an individual's circumstances, experiences, and environmental influences (Hardy et al. 2004; Earvolino-Ramirez 2007; Windle 2012).

Most research focused on resilience is rooted in psychology and has been conducted in the field of child and adolescent development (Aburn et al. 2016). However, more recently research into resilience has expanded across a variety of fields, including nursing, health, psychology, education, emergency services, and armed forces (Windle 2012; Aburn et al. 2016), and the recognition that resilience can be modified, and therefore improved, has led to more recent resilience research focusing on the development of resilience interventions for a broad range of populations (Earvolino-Ramirez 2007). This expansion, as well as focus on actionable recommendations, has made resilience a concept more useful in policy development (Windle et al. 2011; Aburn et al. 2016).

Though the inclusion of resilience in policy is promising, there is some critique regarding the lack of a universal definition for the construct of resilience (Aburn et al. 2016), and

consequently the validity of the construct (Luthar et al. 2000). This can be seen when comparing various definitions presented in policy. The WHO views resilience as the accumulation of protective factors and assets that facilitates positive adaption, moderates vulnerability factors and influences health outcomes (Friedli 2009). The Centre for Policy on Ageing (2014, p. 2) defines resilience as 'the ability to stand up to adversity and to 'bounce back' or return to a state of equilibrium following individual adverse episodes'. Alternatively, the 'Getting It Right For Every Child' framework presents resilience as the opposite of vulnerability, though it does state that resilient characteristics enable children to develop normally despite adversities (Scottish Government 2016).

The definition and conceptualisation of resilience is considered in the following section of this chapter.

3.3 Conceptualising resilience

Definition

The word 'resilient' originates from the Latin word 'resiliere' which means to 'jump back' (Kumpher 1999). In keeping with this, the process of resilience is often defined as the capacity to endure hardship, to 'bounce back', and to move on following adversity (Windle 2012). This key theme of resilience definitions is identified by numerous concept analyses and literature reviews. Dyer and McGuinness (1996) refer to it as the attribute of 'rebounding and carrying on', Earvolino-Ramirez (2007) uses the key words 'rebounding' and 'reintegration' to describe a resilient person's positive response following adversity, while Windle's (2011) definition of resilience recognises that positive adaption or the avoidance of negative outcome is required for resilience.

Aburn et al. (2016) distinguish between 'the ability to bounce back' and 'rising above' in definitions of resilience. Both these terms align closely with the understanding that resilient reintegration is demonstrated by positive outcomes following the overcoming of the adversity (Richardson 2002). However, it is proposed that 'the ability to bounce back' reflects the understanding that resilience is observed when an individual returns to 'normal' functioning following adversity or does 'better than expected' given the circumstances, with studies often making a link between recovery from adversity and 'bouncing back' to baseline health or well-being (Aburn et al. 2016). In comparison, 'rising above' reflects the ability for

individuals to 'flourish' or 'thrive' in the face of adversity, suggesting a move to a superior level of functioning (Richardson 2002; Aburn et al. 2016). Importantly, there should be no expectation that resilience should lead to 'thriving' following adversity (Windle 2012).

Definitions of resilience also recognise that the process of resilience is characterised by adaptation and adjustment (Aburn et al. 2016), with positive adaptation being considered one of the primary consequences of resilience (Luthar et al. 2000; Windle 2011). Earvolino-Ramirez (2007) identified a similar theme in her concept analysis, however she labelled it 'flexibility' to capture the essence of adaptability. She recognised that resilient individuals are able to 'roll with the punches', and are cooperative, amiable, and tolerant (Earvolino-Ramirez 2007), while Dyer and McGuiness (1996) stated that resilient individuals expect to encounter adversities, and in the face of them persevere until their goal is achieved.

Windle (2012) defines resilience as 'the process of negotiating, managing and adapting to significant sources of stress or trauma', while protective and vulnerability factors are understood to facilitate or impede an individual's capacity for adaption (Windle 2011). The presence of protective and vulnerability factors is also frequently referred to in definitions of resilience, as resilience is recognised to be a product of everyday, ordinary, things (e.g. positive experiences in educational environments, close friendships, or previous experiences dealing with challenges). In view of this quality, Masten (2001) referred to resilience as 'ordinary magic', recognising that it is not an extraordinary concept. The conclusion that resilience is built up through ordinary process provides a positive outlook on human development and adaptation as it suggests that all individuals are capable of being resilient (Masten 2001).

While there are several themes that are frequently included in empirical definitions of resilience, a clear and universal definition for resilience is still lacking (Luthar et al. 2000; Aburn et al. 2016). For instance, Aburn et al. (2016) suggested that 'good mental health' should be a key theme in resilience definitions. However, the inclusion of this theme in definitions of resilience is not supported by other existing research, which tends to recognise mental health conditions as a vulnerability factor (Hardy et al. 2004; Hjemdal et al. 2011; MacLeod et al. 2016; Färber and Rosendahl 2018; Hu et al. 2018).

Given the observed variation in resilience definitions, Luthar et al. (2000) urge that all scientific reports must state their definition of resilience and use clear and consistent terminology.

In this thesis resilience is defined as:

> …..the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma. Assets and resources within the individual, their life and environment facilitate this capacity for adaptation and "bouncing back" in the face of adversity. Across the life course, the experience of resilience will vary. (Windle 2011, p. 163)

This definition was chosen as it summarises the key themes identified in definitions of resilience: the importance of positive adjustment in enabling an individual to 'bounce back' following adversity, the unique and individual quality of resilience and the role of non-extraordinary protective factors in facilitating this, and the belief that 'being resilient' does not necessarily result in 'thriving'. Furthermore, this definition highlights the dynamic and contextual nature of resilience, through explicitly stating that resilience is not a stable trait within each individual.

With the intention of using clear and consistent terminology throughout this thesis, additional terms used are defined in Table 3-1.

Table 3-1: Glossary of resilience terminology

TERM	DEFINITION	SOURCE
Adversity	A state or instance of serious or continued difficulty or misfortune that poses a significant risk of a negative outcome.	Windle (2011)
Assets	Refers to individual or social protective factors.	Windle (2011)
Effective coping	Effectively managing adversity to function at an optimal level.	Earvolino-Ramirez (2007)
Mastery	An individual's belief in their ability to influence the environment and bring about desired outcomes through their own skill or knowledge.	Earvolino-Ramirez (2007)
Positive adaptation	Occurs when recovery following an adversity is beneficial or effective.	Earvolino-Ramirez (2007)
Protective factor	Specific assets and resources that are necessary for the process of resilience to occur.	Dyer and McGuinness (1996)

Resilience	The process of effectively negotiating, adapting to, or managing significant sources of stress or trauma.	Windle (2011)
Resources	Refers to community protective factors.	Windle (2011)
Risk	Describes the chance of adversity translating into a negative outcome.	Daniel (2010)
Vulnerability factor	Detrimental influences on an individual's resilience.	Luthar et al. (2000)

3.3.1 Resilience antecedents, protective and vulnerability factors, and consequences

3.3.1.1 Antecedents

Antecedents are defined as situations or events which occur prior to the process of resilience. Resilience is defined as the process by which individuals effectively adapt to and manage adversity (Windle 2011). Therefore, to be resilient there must be the presence of an adversity that poses a significant risk of a negative outcome (Windle 2011; Schwarzer and Warner 2013). This adversity brings about disruption and challenge in an individual's life, which is required for the resilience process to occur. Once faced with adversity individuals can use, or learn, resilient qualities which enable them to adapt well (Richardson 2002). Adversity is the single variable that distinguishes resilience from other social management processes (Earvolino-Ramirez 2007) and separates the concept of resilience process from the personality trait of ego-resilience (Luthar et al. 2000).

Adversities can vary in nature, being biological, psychological, economic, or social, as well as in severity (Windle 2011). Furthermore, the experience of adversity can also vary from individual to individual; what may be perceived as a serious threat by one person may not by another (Windle 2011). Given the varied natures and perceptions of adversities, it has been recommended that any findings regarding the occurrence of resilience in the face of an adversity should be considered solely within the context of that specific adversity, in order to increase the validity of resilience research (Vanderbilt-Adriance and Shaw 2008).

Dyer and McGuiness (1996) suggest that there is one further antecedent to the process of resilience: the presence of at least one caring and emotionally available person at some point in the individual's life. They suggest that this person demonstrates the inherent worth of a human, which is crucial to the development of resilience (Dyer and McGuiness 1996). This

antecedent is not proposed by other authors, however the ability to have close, positive, relationships with family and friends have consistently been found to improve individuals' resilience (Earvolino-Ramirez 2007).

3.3.1.2 Protective and vulnerability factors

Factors associated with resilience can be divided into two broad categories: 'protective factors' and 'vulnerability factors' (Luthar et al. 2000). These factors exist in three domains: individual, social, and community (Windle 2011).

Protective factors are specific assets and resources that help the individual to adapt and cope, and make adversities less disruptive (Dyer and McGuinness 1996; Richardson 2002). Vulnerability factors, on the other hand, can negatively affect an individual's response to adversity (Rutter 1990; Fleming and Ledogar 2008). Across resilience research, researchers use the terms 'vulnerability factors' and 'risk factors' inconsistently, leading to misinterpretation of results (Luthar et al. 2000). As the term 'risk' is often used to describe the chances of adversity translating into actual negative outcomes (Daniel 2010), there is a call for the term 'vulnerability factors' to be used to describe detrimental influences on an individual's resilience (Dyer and McGuinness 1996; Luthar et al. 2000; Fleming and Ledogar 2008).

Fleming and Ledogar (2008) argue that protective and vulnerability factors should be investigated together, as the identification of vulnerability factors helps determine the causal processes in resilience. This is also important as in certain circumstances an influential factor may be protective for some but increase vulnerability in others (e.g. a care package may increase dependency in some individuals, thus reducing their resilience, while for others it may be their primary form of social interaction and support, thus increasing their resilience). Furthermore, both protective and vulnerability factors can have a cumulative effect, whereby they have a greater effect on an individual's resilience when occurring together (i.e. multiple protective factors or multiple vulnerability factors) (Rutter 1990; Fleming and Ledogar 2008).

Despite this, protective factors and processes tend to receive more focus in resilience literature, as it has been suggested that enhancing protective factors would be more effective than reducing vulnerability factors to improve resilience (Lee et al. 2013). This is supported by a meta-analysis of demographic and psychological variables associated with resilience which found that the largest effect on resilience comes from protective factors, followed by vulnerability factors. However, vulnerability factors such as anxiety, depression,

negative affect, perceived stress, and post-traumatic stress disorder have been found to be associated with lower resilience in multiple populations (Lee et al. 2013). Therefore, exploring vulnerability factors facilitates the development of a fuller and more holistic conceptualisation of resilience, strengthening knowledge about the causal processes in resilience, and potentially enabling the identification of individuals who would benefit from resilience interventions (e.g. those with depression or post-traumatic stress disorder) (Fleming and Ledogar 2018).

The first wave of resilience research focused on identifying factors associated with resilience as it was understood that by determining the factors that promote or interrupt resilience, individuals' resilience could be promoted (Lee et al. 2013). During the subsequent wave of resilience research, the meaningfulness of these factors was questioned, as Rutter (1987) posed that the protective processes are of greater value in developing resilience interventions. Nevertheless, the presence of protective and vulnerability factors and identification of them is still valued as they are 'robust predictors' of resilience (Rutter 1987; Lee et al. 2013).

However, a protective or vulnerability factor for one individual may not have the same influence on another individual's resilience even when in a similar situation (Earvolino-Ramirez 2007). Furthermore, the effect of an individual's protective and vulnerability factors may vary depending on the situation, i.e. a protective factor that leads to healthy outcomes in one situation may not lead to healthy outcomes for the same individual in a different situation (Johnson and Wiechelt 2004). Consequently, resilience research is generally conducted with specific populations of individuals experiencing particular adversities, demonstrating again that resilience research findings are context-dependent (Vanderbilt-Adriance and Shaw 2008).

Despite this, several studies have sought to identify factors associated with resilience that are context-independent (Dyer and McGuinness 1996; Earvolino-Ramirez 2007; Windle 2011; Lee et al. 2013; Smith et al. 2013). These factors primarily consist of protective, individual assets and are defined in Table 3-2.

Given the focus of this thesis is the resilience of older adults, protective and vulnerability factors associated specifically with the resilience of older adults are presented later in sections 3.5.3 and 3.5.4 of this chapter.

Table 3-2: Context-independent protective factors

PROTECTIVE FACTOR	DEFINITION	SOURCES
Individual assets		
Self-efficacy	'People's belief that they have control over their own functioning and what occurs in the environment'	Earvolino-Ramirez (2007) Lee et al. (2013)
Flexibility	'The essence of adaptability, being able to roll with changes, being cooperative, amiable, and tolerant, and having an easy temperament'	Earvolino-Ramirez (2007)
Self-determination	The 'feeling that regardless of what the circumstances of barriers are in life, the individual will overcome the barriers and excel'	Dyer and McGuinness (1996) Earvolino-Ramirez (2007) Smith et al. (2013)
Sense of humour	'Sense of humour plays an important role in the ability to make light of adversity, to enhance coping mechanisms, and to moderate the intensity of emotional reactions'	Earvolino-Ramirez (2007)
Optimism	'The tendency to believe that one will generally experience good outcomes in life' 'The tendency to have positive expectations about outcomes in the future'	Lee et al. (2013) Smith et al. (2013)
Life satisfaction	'A global assessment of a person's quality of life according to his chosen criteria'	Lee et al. (2013)
Positive affect	'The extent to which a person feels enthusiastic, active and alert'	Lee et al. (2013)
A sense of self	'An appreciation and acceptance of what has transpired in life'	Dyer and McGuinness (1996)
Spirituality	'Religious service attendance, religious salience, and spiritual salience'	Smith et al. (2013)
Social assets		
Social support	'Social support and meaningful relationships with at least one peer or family member' 'Healthy attachments to other individuals'	Dyer and McGuinness (1996) Earvolino-Ramirez (2007) Lee et al. (2013) Smith et al. (2013)

3.3.2 Outcomes

Outcomes are the endpoints that occur as a result of the resilience process and the interaction between antecedents, vulnerability factors, and protective factors (Windle 2011). It is suggested that there are three significant outcomes of resilience: effective coping, mastery, and positive adaptation (Earvolino-Ramirez 2007).

3.3.2.1 Effective coping

The primary outcome of resilience is 'effective coping' (Dyer and McGuinness 1996). Described as 'effectively managing the adversity one is faced with in order to function at an optimal level' (Earvolino-Ramirez 2007, p. 78), effective coping reflects the understanding that resilient individuals are able to persevere and continue to function despite facing adversity.

It is suggested that the assessment of effective coping, and therefore the strength of an individual's resilience, should be guided by the nature of the adversity. In the face of severe adversity, it may be that the maintenance of near-normal functioning and well-being is a sign of resilience, while near-normal functioning following a minor adversity reflects dysfunctional integration (Windle 2011). Additionally, the severity of the adversity may also be altered by the subjective opinion of the individual experiencing it (Windle 2011).

3.3.2.2 Mastery

The second potential outcome of resilience is mastery, which is defined as an individual's belief in their ability to influence the environment and bring about desired outcomes through their own skill or knowledge (Earvolino-Ramirez 2007; Burns et al. 2010). Conceptually, mastery differs from resilience in several ways. Firstly, mastery is a cognitive or affective resource that helps one develop a sense of self-control, skill, or knowledge (Earvolino-Ramirez 2007; Rueda et al. 2012). Secondly, while resilience requires the antecedent of an adversity, mastery can develop without adverse experiences (Emlet et al. 2017). Consequently, mastery is a term more commonly used in self-efficacy literature, as it recognises that self-efficacy is built through successful performance of the activity of interest, or 'mastery experiences', without the need for adversity (Bandura 1997). Nevertheless, through the successful completion of activities during adversity, mastery has the potential to be a consequence of resilience.

3.3.2.3 Positive adaptation

'Positive adaptation' refers to the development of skills and knowledge during adversity, leading to personal growth and increased strength of resilient qualities (Richardson 2002; Earvolino-Ramirez 2007). The occurrence of positive adaptation results in the 'beneficial' or 'effective' recovery of an individual following the adversity (Earvolino-Ramirez 2007).

The distinction between beneficial and effective recovery is of importance. Beneficial recovery refers to the improved well-being of an individual following an adversity, when compared to their well-being prior to the adversity (Earvolino-Ramirez 2007; Staudinger et al. 1995). However, while some resilient individuals may be seen to thrive, and emerge stronger following adversity, others may simply do 'better than anticipated' given their circumstances (Windle 2012). Positive adaptation leading to effective recovery therefore refers to the maintenance or regaining of normal or 'better than expected' levels of adaptation and functioning following an adversity (Staudinger et al. 1995; Windle 2011).

This distinction between normal levels of adaptation and a level of superior adaptation was also noted by Staudinger et al. (1995) who used the term 'reserve capacity' to refer to factors and resources that promote growth beyond the current and normal level of functioning.

It is further understood that the consequences of resilience vary between individuals and can vary for one individual based on the context of the adversity. As such, positive adaptation leading to beneficial recovery should not be an expected outcome of resilience (Windle 2012). In comparison, positive adaptation leading to effective recovery is understood to be an outcome achievable for all resilient individuals (Windle 2012).

3.4 Approaches to resilience research

Resilience research tends to follow one of two approaches. The first 'person-focused' approach is prevalent in qualitative research as it puts emphasis on people, rather than specific characteristics, and seeks to understand how individuals with high resilience differ from those with low resilience, in a given circumstance (Masten and Reed 2002).

Conversely, the second approach examines the relationships between individual characteristics, environments, and adversities to ascertain how resilience manifests itself.

This approach is described as 'variable-focused' and lends itself to quantitative research as it often draws upon a sample of an 'at risk' group, the measurement of potential protective and vulnerability factors, and the use of multivariate statistics (Masten and Reed 2002).

3.4.1 Person-focused approaches

As mentioned, person-focused approaches are more prevalent in qualitative research as they focus on people, rather than specific vulnerability or protective factors (Masten and Reed 2002). Qualitative research that takes the person-focused approach, and produces 'person-focused models', tends to do so in one of three ways (Masten and Reed 2002).

The first is through the case studies of specific individuals. These case studies often recruit 'remarkable' individuals who may also have inspired larger studies, or individuals who were recruited for mixed-methods research, with the case study illustrating the findings of the larger study the participant was involved in (Masten and Reed 2002).

The second method for developing person-focused models of resilience produces 'classic models' of resilience. Studies following this method recruit an 'at risk' participant group and divide them into a 'resilient' subgroup and a 'not resilient' subgroup based on how well they respond to the adversity, measured by their achieved outcomes (Masten and Reed 2002). The two groups are then compared to identify factors that indicate a better outcome, and therefore, greater resilience. However, the validity of the models produced is often critiqued as it is argued that the studies' resilient subgroups could just have been exposed to a lesser level of the adversity (Masten and Reed 2002).

The third person-focused models of resilience are called 'full diagnostic models'. Full diagnostic models aim to identify comparable groups of individuals who show patterns of good or poor adaption, despite similar levels of adversity (Windle 2011). This research can then compare between those who are resilient (high on both adversity and good outcomes), the maladaptive (high on adversity and have poor outcomes), the competent-unchallenged (low on adversity and have good outcomes), and the vulnerable (poor outcomes despite adversity being low) to identify potential protective or vulnerability factors (Masten and Reed 2002). This classification of participants is useful for identifying the proportion of a population who may be classed as resilient (Windle 2011). However, inconsistencies in measurement make it difficult to determine category cut-offs. Consequently, there is

inconsistency in resilience prevalence estimates, which can range from 25% to 84% (Vanderbilt-Adriance and Shaw 2008). This makes it difficult to compare the proportion of resilient individuals across studies, even if the populations share similar demographics and experience similar adversities (Windle et al. 2011).

Given that the process of resilience, and the factors associated with it, are understood to be contextual, situational, and individual, qualitative person-focused approaches have tended to dominate research into this complex construct (Tusaie and Dyer 2004). This approach is holistic in nature and provides detailed descriptive information to understand the individual experience of resilience when facing an adversity (Masten and Reed 2002). However, these approaches tend to share the limitations of other qualitative research; that it is a time-consuming process, is more easily influenced by the researcher's personal biases, and uses smaller samples, which produces results that cannot be generalised to a larger population (Anderson 2010). Consequently, it is much harder to base practice and policy on research that adopted a person-focused approach.

3.4.2 Variable-focused approaches

Variable-focused approaches are more prevalent in quantitative research and are best used when research seeks to measure the relationship between resilience factors and an individual's response to adversity. These methods are also used to assess the prevalence of protective and vulnerability factors within a specific population. However, not all variable-focused approaches present the influence of protective and vulnerability factors on resilience in the same manner. Within the variable-focused approach there are several models. Masten and Reed (2002) identified three models that provide the basis for empirical research; these were labelled 'additive models', 'interactive models', and 'indirect models'. More recent research has referred to additive models as 'compensatory models' and interactive models as 'protective models' (Fleming and Ledogar 2008; Windle 2011).

Additive models or compensatory models are the simplest of the variable-focused models, with protective and vulnerability factors having independent effects on an individual's response to adversity (Figure 3-1) (Masten and Reed 2002; Windle 2011). Accordingly, research adopting this approach commonly uses regression modelling to examine the factors' main effects (Windle 2011). In this theoretical model, assets can outweigh and counteract vulnerability factors. Additionally, it is assumed that the factors only have

influence when they are present; for instance, an absent protective factor does not cause a negative effect. Thus, practice based on these models tends to focus on risk aversion and compensatory techniques (Masten and Reed 2002).

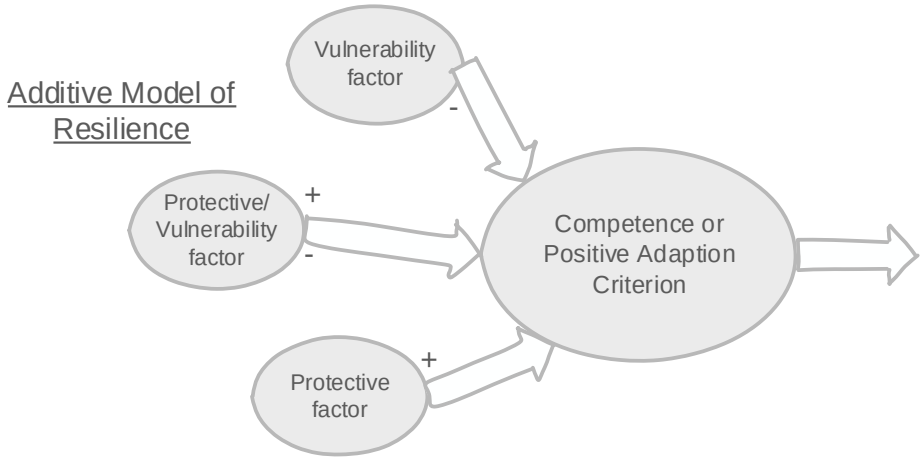


Figure 3-1: Additive model of resilience (adapted from Masten and Reed 2002)

The second variable-focused models are the interactive models or protective models of resilience (Figure 3-2). Interactive models state that moderating factors alter the impact of a risk on an individual's response to adversity (Masten and Reed 2002; Fleming and Ledogar 2008; Windle 2011). These models are commonly tested through the inclusion of an interaction term between the risk and protective factors in multiple regression (Windle 2011).

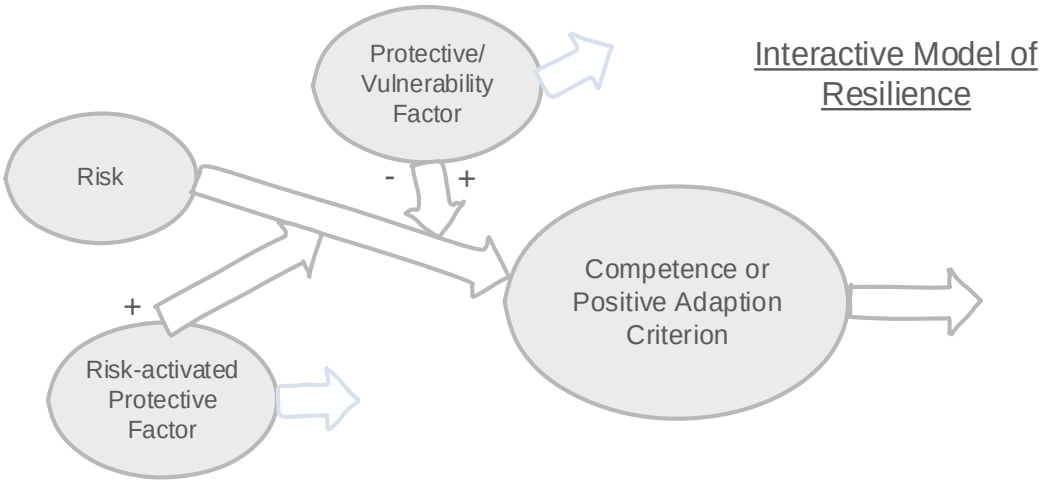
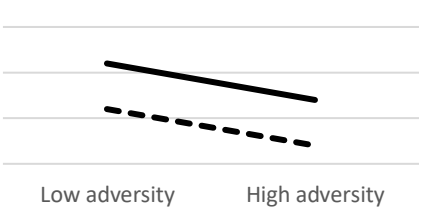
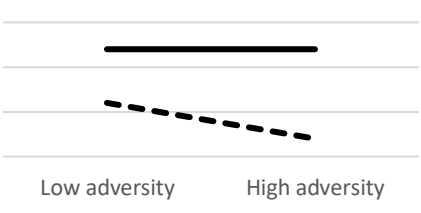
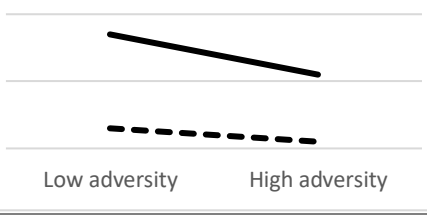


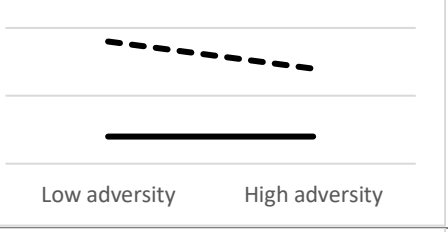
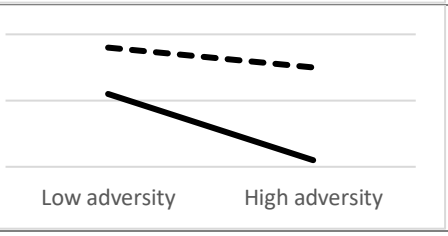
Figure 3-2: Interactive model of resilience (adapted from Masten and Reed 2002)

Moderators are generally termed protective and vulnerability factors, depending on whether they have a beneficial or detrimental effect on one's response. However, they can be further subcategorised into simple moderators and risk-activated moderators (Masten and Reed 2002). Simple moderators refer to permanent or long-lasting qualities or characteristics that individuals possess which predispose them to be more or less resilient. Examples of these may be their gender, previous experiences, marital status, or optimistic attitude. Risk-activated moderators are understood to be brought about by the presence of the risk (e.g. family members moving in with an individual when they become unwell). Considering the emphasis on the positive effect of protective factors, practice based on these models tends to focus on asset increase to reduce the impact of adversities.

Luthar (1993; 2000) proposes a more detailed range of labels for the interactive processes resulting from this model approach. They are summarised and illustrated in Table 3-3.

Table 3-3: Effects of moderator variables (Adapted from Luthar et al. 2000)

LABEL	DEFINITION	ILLUSTRATED EFFECTS Attribute present Attribute absent
Protective	The advantage of having the attribute is constant across levels of adversity.	
Protective-stabilising	The general advantage of individuals with the attribute remains stable despite increasing adversity.	
Protective-enhancing	The advantage of individuals with the attribute increases as adversity increases.	
Protective but reactive	There is an overall advantage of individuals with the attribute, however this is decreased as adversity increases.	

Vulnerable-stable	The general disadvantage of individuals with the attribute remains stable despite increasing adversity.	
Vulnerable and reactive	The disadvantage of individuals with the attribute increases with greater adversity.	

The final variable-focused model suggested by Masten and Reed (2002) is the indirect model of resilience; two examples of these models are provided in Figure 3-3. The first (a) illustrates the mediatory effect of a protective factor, which influences and explains the relationship between another factor and an individual's response to adversity. The second example (b) is the invisible effect of total prevention, where a strong protective factor prevents the adversity from impacting a person's response at all (Masten and Reed 2002). Practice based on indirect models of resilience tends to focus on process facilitation, as it recognises that individual, social, and environmental dynamics foster resilience (Masten and Reed 2002).

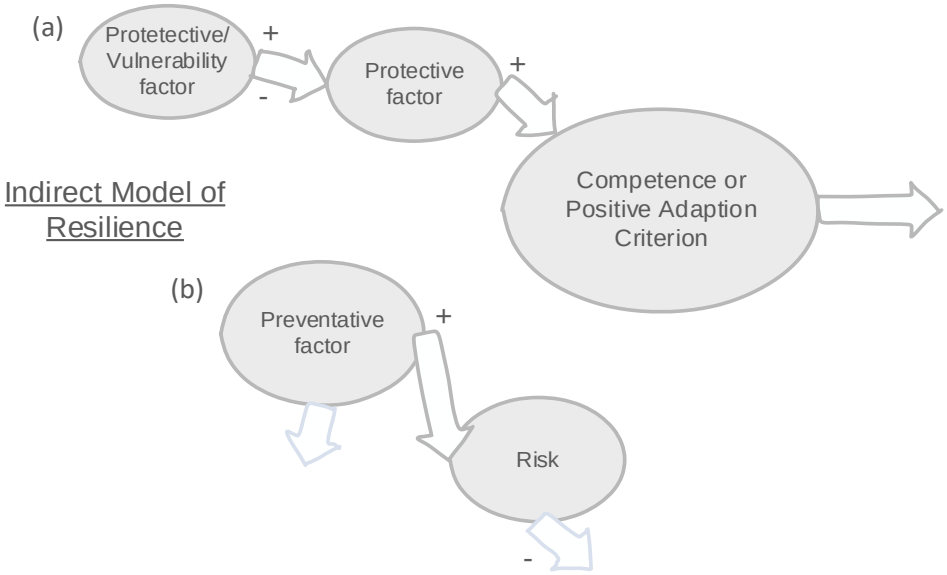


Figure 3-3: Indirect model of resilience (adapted from Masten and Reed 2002)

Some authors suggest that there is a fourth variable-focused model of resilience, the 'challenge model' (Fleming and Ledogar 2008; Windle 2011). The challenge model describes a curvilinear relationship between a risk and an outcome, where exposure to low and high levels of the risk results in a negative outcome, but moderate levels of risk lead to positive (or less negative) outcomes (Fleming and Ledogar 2008). The model assumes that the moderate level of risk is important for learning how to be resilient (Windle 2011). Consequently, challenge models are often investigated by longitudinal research which examine how repeated exposure to adversities prepares individuals to face future difficulties (Fleming and Ledogar 2008). While often seen as a separate model of resilience, it is argued that the challenge model is an extension of the additive/compensatory model as they still investigate the relationship between one vulnerability factor and the outcome, though they do require a polynomial term to be included in the multiple regression model (Windle 2011).

As previously stated, variable-focused models tend to be used in quantitative research. As a result they often have larger sample sizes which provide more generalisable results which are useful for policy and for practice (Creswell 2014). An increase in quantitative resilience research has also enabled the identification of key factors that strongly correlate with resilient outcomes across domains (e.g. self-efficacy and social support) and has supported the development of multidimensional resilience measures (Smith et al. 2013). These resilience measures alleviate the criticism that early variable-focused models were unidimensional, focusing solely on a single outcome that suggested a person was resilient (e.g. lack of depressive symptoms) which did not reflect the essence of resilience (Masten and Reed 2002; Tusaie and Dyer 2004).

Nevertheless, Masten and Reed (2002) suggest that there are two further criticisms of the variable-focused approach; that they can look for one-way relationships between factor and outcome and that they do not offer the holistic view of resilience that person-focused models do. Given that resilience is not static and can be built up through positive adaptation in the face of previous adversity (Seery et al. 2010; 2013) it is likely that some of the relationships between factor and outcome are reciprocal. However, these relationships would differ for each individual, for instance, not all individuals develop improved resilience and functioning as a result of positive adaptation in the face of a previous adversity, some may adapt but feel

exhausted as a result. The relationship may also vary relative to the length of time between adversities and other life events that occur between them (e.g. death of a spouse).

Consequently, Tusaie and Dyer (2004) advocate for the use of both approaches in partnership stating that the clearest descriptions of resilience come from mixed methods approaches, where a quantitative resilience scale is correlated with population-specific outcome measures, and a qualitative section addresses the individual dynamics of resilience.

In practice the development of models of resilience appears to consist of two stages, which are in keeping with the advice of Tusaie and Dyer (2004). First, the potential protective and vulnerability factors of a particular population are identified through person-focused research with a small number of specific individuals. Based on this research the identified factors are then studied in a larger sample using a variable-focused approach and quantitative methods.

3.4.3 Measuring resilience

Quantitative research relies upon the availability of valid and reliable measurement instruments. With the large proportion of resilience research being qualitative, coupled with the variety of definitions of resilience that are proposed in literature, the measurement of resilience has previously lacked empirical instruments (Tusaie and Dyer 2004).

However, as resilience research has developed consistent resilience resources have been identified across various populations, leading to the development of resilience measures. Many of these measure factors thought to promote resilience, such as social skills, concepts of control, adaptability, and self-esteem (Smith et al. 2013). This measurement technique makes use of empirical referents, which are 'classes or categories of actual phenomena that by their existence or presence demonstrate the occurrence of the concept itself' (Walker and Avant 2005, p. 46). As the construct of resilience is abstract, empirical referents are needed to make the concept measurable (Thorén 2014). It is suggested that measures which take this approach would be better described as 'measuring the process leading to a resilient outcome' (Windle et al. 2011, p. 14).

Using the same definition of resilience that is used in this thesis, Windle et al. (2011) conducted a systematic review of resilience measurement scales to evaluate psychometric properties; their review covered 15 measures. The majority of the measures focused solely

on the individual characteristics that influence resilience, despite it being widely accepted that resilience is associated with individual, physical, and relational resources (Windle 2011; Windle et al. 2011; Liebenberg et al. 2012). Only the Resilience Appraisal Scale (Johnson et al. 2010) included items pertaining to both personal and social determinants of resilience, however, it still lacks items related to an individual's physical environment and community resources which can influence resilience.

Furthermore, 14 of the 15 measures included in Windle et al.'s (2011) review used empirical referents to measure resilience. In contrast, the Brief Resilience Scale (BRS) was developed to assess resilience as the ability to 'bounce back' and was designed to measure resilience in a more explicit manner (Smith et al. 2008). The intention was that the BRS would make it possible to measure the process of resilience rather than the factors which may promote it (Smith et al. 2013). Nevertheless, the items of the BRS, while corresponding to the ability to recover following adversities, all reflect a sense of personal agency, which again assesses resilience at the individual level only (Windle et al. 2011). Furthermore, while the BRS could be useful for assessing the ability of individuals to 'bounce back', it does not identify resources or assets that facilitate this outcome, which are important in clinical practice (Windle et al. 2011).

In view of this, it is recommended that resilience measures should have a multidimensional perspective of resilience that spans individual and environmental (both physical and social) assets and resources, in order to more fully identify an individual's protective and vulnerability factors and facilitate the development of resilience interventions (Windle et al. 2011). It is also recommended that valid resilience measures developed for specific populations would enable research into public health and well-being, so that resilience research can be translated into policy (Windle et al. 2011).

This literature review has repeatedly highlighted the unique nature of resilience, which is shaped by individual, environmental, and contextual factors (Vanderbilt-Adriance and Shaw 2008; Windle et al. 2011). Hayman et al. (2017) suggest that old age is a specific context in which resilience should be studied. They argue that in older adults feelings of vulnerability are triggered more by 'fear of the unknown' than by frailty characteristics, and that the resources which older adults can draw upon are different in advanced age, with psychosocial resources being more accessible than physical resources (Hayman et al. 2017).

Misunderstanding the components of resilience in any context risks placing importance on factors which do not matter (Hayman et al. 2017). Consequently, the following section of this chapter summarises the findings of the resilience research which has been conducted with older adults.

3.5 Resilience in older adults

The contribution of resilience to geriatric research, and the application of it in geriatric practice was discussed in the previous chapter (Section 2.3). In this section the results of resilience research in the geriatric field are reviewed.

3.5.1 Measuring the resilience of older adults

In 2016, Cosco et al. undertook a systematic review of studies that assessed the psychometric properties of resilience measures with samples aged greater than 60. Five resilience measures were included; the Connor Davidson Resilience Scale (CD-RISC) and its abbreviated 10-item version, the Resilience Scale and its abbreviated five and 11 item versions, and the Brief Resilient Coping Scale. Cosco et al. (2016) concluded that all five scales demonstrated acceptable levels of convergent and discriminant validity, internal consistency, and theoretical construct validity to support the continued use of these measures in older populations. However, each of these measures assess resilience solely at the individual level (Sinclair and Wallston 2004; Windle et al. 2011). The lack of attention on environmental factors, specifically on family and community resources, is particularly problematic when assessing the resilience of older adults, as research has shown that the influence of situational and social factors on resilience is likely to be increased in advanced age (Hayman et al. 2017). Additionally, all the validation studies included in Cosco et al.'s (2016) review recruited community-dwelling older adults, living either at home or in retirement communities, thus limiting each measures' applicability to older adults receiving healthcare services.

In recognition of the publication by Windle et al. (2011) which recommends the use of multidimensional resilience measures which consider both individual and environmental determinants of resilience, a few multidimensional resilience measures for older adults have been developed. These include the Multidimensional Individual and Interpersonal Resilience

Measure (MIIRM) (Martin et al. 2015a) and the Making it CLEAR questionnaire (QMU and NHS Lothian 2015).

The MIIRM was developed to assess the family and individual resilience of older adults, it consists of 22 items that span eight factors. These factors included self-efficacy, access to a social support network, optimism, perceived economic and social resources, spirituality and religiosity, relational accord, emotional expression and communication, and emotional regulation (Martin et al. 2015a). The validation of the MIIRM found that at the individual level the MIIRM shared the common latent measurement as the CD-RISC. However the MIIRM also measures resilience at the inter-personal level, enabling it to provide a fuller evaluation of older adults' resilience (Martin et al. 2015a).

Similarly, the MiC questionnaire was developed to reflect a multidimensional perspective of resilience that spans individual and environmental assets and resources (QMU and NHS Lothian 2015). It consists of two subscales, one assessing the individual determinants of resilience (IDoR) while the other assesses the environmental determinants of resilience (EDoR) (QMU and NHS Lothian 2015). The IDoR subscale consists of 21 items that were designed to correspond with an individual's habituation, volition, or performance skills (motor skills, social interaction skills, and process skills). The EDoR subscale consists of 13 items which theoretically correspond to the physical and social environment. Over the 34 items, question subsets were designed to relate to self-care, leisure, work, responsibilities, physical environment, social environment, resources, habits, values, self-efficacy, motor skills, communication skills, and process skills (QMU and NHS Lothian 2015).

When comparing the MIIRM and the MiC questionnaire, both are relatively new measures and are at early stages of development and use. As a result, both have only been used in specific locations (the US and Scotland, respectively). Consequently, further research would be needed to determine the applicability of the measures to other nations and cultures. In particular Martin et al. (2015a) recognise that some of the wording in their questionnaire refers directly to the US and would need to be adapted for international use. Martin et al. (2015a) also recognise that a limitation of the MIIRM is that it did not include any health- or physical functioning-related questions. In comparison the MiC questionnaire includes three items which are related to the individual's perceived health (items 20, 23 and 24, see Appendix 1). It is also noted that the MIIRM does not include questions relating to the physical environment, while the MiC questionnaire includes three items related to this

(questions B, 3 and 4). It could be concluded then, that the MiC questionnaire provides a more robust evaluation of older adults' resilience. However, factor analysis is needed to ensure that the MiC questionnaire measures the factors it is purposed to.

While the MIIIRM and MiC questionnaire offer more multidimensional assessments of resilience, both share one limitation with the measures included in the review by Cosco et al. (2016), in that they were developed in the community. This is reflective of most of the current geriatric resilience literature which recruits community-dwelling older adults. As a result, there is a lack of research which investigates the resilience of older adults in other settings, consequently qualitative articles have attempted to bridge the gap between current resilience research and other populations of older adults. An example of this is Esche and Tanner (2005) who wrote a qualitative article suggesting that resilience should be considered when discharging older adults home from hospital.

3.5.2 Adversities of older adults

Losses, particularly related to physical health and social networks, seem central to the adversities faced by older adults. While clinicians and researchers may assume that physical, psychological, and social losses related to frailty are the primary sources of adversity for older adults (Hayman et al. 2017), research suggests that medical and non-medical events may have an equal impact upon older adults' lives (Hardy et al. 2002).

In their study with community-dwelling older adults, Hardy et al. (2002) asked participants to identify stressful life events from the previous five years; 18% identified a personal illness/injury, 42% identified the death of a family member or friend, 23% the illness/injury of a family member or friend, and 17% a non-medical event. Non-medical events included changing residence, retirement, or the divorce or unemployment of a child (Hardy et al. 2002). Similar adversities were identified by Hildon et al. (2008), who, following interviews with 32 older adults, defined adversity for older adults as 'physical, mental or social losses that limit circumstances or opportunities'. In their interviews these losses were primarily talked about in relation to the death or illness of a loved one, their own ill health, and circumstances surrounding their retirement (Hildon et al. 2008). Further research has also suggested that socio-economic disadvantage and elder abuse may be a source of adversity to older adults (Lowenstein et al. 2009). In comparison to children, adversities older adults

face are also more likely to be isolated events (e.g. loss of spouse), but still significantly disruptive (Bonnano 2004; 2005).

Though there appears to be a consensus about the primary adversities faced by older adults, it should not be assumed that the adversities, whether medical or non-medical, would have the same negative impact across the whole older adult population (Staudinger et al. 1993). Furthermore, not all risks are equivalent in severity; some may be acute while others chronic (Vanderbilt-Adriance and Shaw 2008). Additionally, the severity or stressfulness of the event may be perceived differently between individuals (Hardy et al. 2004). Two examples of this are discussed below.

For older adults retirement or 'leaving employment' marks a change of roles, social environment, and financial resources. It could be assumed that the loss of roles and social connections increases the risk of negative outcomes, however leaving employment may also give older adults more time to engage in other meaningful activities and spend more time with family and friends. This balance was investigated by Hildon et al. (2008), who identified that leaving employment was experienced in a range of ways by their participants. For resilient individuals retirement tended to be a gradual process, either because their workplace allowed flexible retirement, or because the business was family owned. Likewise, having control over the retirement process was a major theme for resilient individuals (Hildon et al. 2008). In comparison, leaving employment for the vulnerable group was often a negative experience, characterised by sudden and premature endings, and was followed by periods of excessive drinking, depression, and boredom (Hildon et al. 2008).

The findings of Hildon et al. (2008) also reflect the interdependence of resilience-related factors. In situations where mental or physical ill health was an adversity, retirement became a protective factor, as resilient individuals saw retirement as a means of recovery.

Another example of an 'adversity' which may or may not pose risk is 'dependency'. Becoming more dependent in old age is generally considered to have a negative influence on an older adult's health and well-being, while independence in ADL is recognised as a protective factor against adversities (Torma et al. 2013; Silverman et al. 2015; MacLeod et al. 2016). However, dependency could also bring about several new assets, including freeing up resources, new social connections, and a decline in other adversities such as stress associated with day to day life management (Staudinger et al. 1993; Hayman et al. 2017).

3.5.3 Protective factors of older adults

A large variety of potentially protective factors have been identified in older adults, from the reviewed studies 50 resilient characteristics or factors were identified (Table 3-4). Similar factors have been grouped to identify key themes in the protective factors of older adults.

3.5.3.1 Protective factors within the individual

3.5.3.1.1 Sociodemographic resources

The relationship between sociodemographic variables (e.g. age, income, and education) and resilience have been studied in older adult populations, however the relationship between them is inconsistent.

In several studies chronological age has been found to associate with resilience. Most of these studies suggest that older adults' resilience decreases as age increases (Lamond et al. 2008; Polson et al. 2018; Scelzo et al. 2018; Bartley et al. 2019; Liddell and Ferreira 2019). However, several studies have found that the relationship between age and resilience is not significant (Lee et al. 2008; de Paula Couto et al. 2011; Li et al. 2015), while others have found that being older is a protective factor (Torma et al. 2013; Fullen et al. 2018).

In Scelzo et al.'s (2018) study participants were grouped according to their age. It was found that being younger was a protective factor in a population of older adults aged 51-75, however, between the ages of 90-101 the relationship reversed (Scelzo et al. 2015). It is suggested that this may be due to 'older old adults' having more experience of adversity as a result of a longer ageing process, thus equipping them to deal with new adversities (Hayman et al. 2017), whereas 'younger older adults' will have fewer of these experiences. Additionally, 'younger older adults' may be more likely to compare their own abilities and health against younger peers, or against their own previous health status which may decrease their resilience (Ferring and Hoffman 2007).

In comparison to the relationship between age and the resilience of older adults, the relationships between income or education and resilience are assessed less frequently. It is suggested that this is due to many older adults leaving work before they would be eligible for geriatric research, and the assumption that many years will have passed since older adults were last receiving education.

Despite this, five studies identified income as a protective factor for older adults' resilience. Hardy et al. (2004), Li et al. (2015), Liu et al. (2018), and Torma et al. (2013) found that having

a larger income was associated with greater resilience. It was proposed that having a higher income may enable older adults to participate in more social experiences and would provide the resources needed to obtain more formal support, thus enabling them to deal with hardships and promoting resilience (Hardy et al. 2004; Liu et al. 2018). Similarly, Martin et al. (2015) found that a better perception of an individual's financial resources resulted in greater resilience. However, a study by Hildon et al. (2010) found that having 'adequate' or 'more than adequate' finances were not considered protective factors when facing adversity, while de Paula Couto et al. (2001) found that the relationship between resilience and income was not significant. The role of income as a protective factor is, therefore, not conclusive.

Similar inconsistencies can be seen when assessing the relationship between education and resilience. Several studies have reported that having a higher level of education is a protective factor (Lamond et al. 2008; Fullen et al. 2018), however this relationship has been found to be non-significant in other studies (Torma et al. 2013; Li et al. 2015; Bartley et al. 2019).

3.5.3.1.2 Positive self-perceptions

The theme 'positive self-perceptions' emerged from three undisputed protective factors found across 11 studies: strong self-efficacy (Hardy et al. 2004; Edwards et al. 2015; Martin et al. 2015a; Frietag and Schmidt 2016; Hayman et al. 2017; Liu et al. 2018; McClain et al. 2018), high self-esteem (Lee et al. 2008; Windle et al. 2008), and self-acceptance (Wiles et al. 2012; Bolton et al. 2016; Hayman et al. 2017). Positive self-perception therefore encompasses an individual's belief that they are able to achieve their goals, however, it also includes the recognition and acceptance that the process of ageing alters their experiences.

Self-efficacy is the motivation and belief to bring about a specific goal in a certain context or situation (Resnick 2014). It has been studied in relation to resilience as an individual's level of self-efficacy is an indicator of their belief in their ability to overcome adversity (McClain et al. 2018). In the development of the MIIRM, Martin et al. (2015a) found that the self-efficacy of their population explained the greatest percentage of variance in their resilience scores (15.8%). Self-efficacy has also been found to have a strong association with resilience in various populations and contexts, including in hospitalised older adult stroke survivors (Liu et al. 2018).

Table 3-4: Protective factors of older adults

OVERARCHING THEME	ORIGINAL FACTORS
WITHIN THE OLDER ADULT	
Sociodemographic resources	Lower age (Lamond et al. 2008; Polson et al. 2018; Scelzo et al. 2018; Bartley et al. 2019; Liddell and Ferreira 2019) Higher level of education (Lamond et al. 2008; Fullen et al. 2018) Income (Hardy et al. 2004; Torma et al. 2013; Li et al. 2015; Liu et al. 2018) Perceived economic resources (Martin et al. 2015b)
Positive self-perceptions	Strong self-efficacy (Hardy et al. 2004; Edwards et al. 2015; Martin et al. 2015a; Frietag and Schmidt 2016; Hayman et al. 2017; Liu et al. 2018; McClain et al. 2018) High self-esteem (Lee et al. 2008; Windle et al. 2008) Self-acceptance (Wiles et al. 2012; Bolton et al. 2016; Hayman et al. 2017)
Positive psychological resources	Good self-rated health (Hardy et al. 2004) Happiness/positive emotions (Ong et al. 2006; Fullen et al. 2018) Optimism (Lamond et al. 2008; Lee et al. 2008; Edwards et al. 2015; Martin et al. 2015a; Martin et al. 2015b; Bolton et al. 2016; MacLeod et al. 2016; Lu et al. 2017) Emotional regulation (Martin et al. 2015a; Hayman et al. 2017) Altruism (Bolton et al. 2016) Grit (Bolton et al. 2016) Hope (Polson et al. 2018) Morale (Wagnild and Young 1993) Autonomy (Stephens et al. 2015) Satisfaction in life (Wagnild and Young 1993; Rossi et al. 2007; Fullen et al. 2018; Liddell and Ferreira 2019)
Good cognitive abilities	Cognitive functioning (Lamond et al. 2008; MacLeod et al. 2016)

	Cognitive strategies (Bauman et al. 2001) Communication skills (Martin et al. 2015a)
Positive health behaviours	Good mental health (Hardy et al. 2004; Nygren et al. 2005; Lamond et al. 2008; Wells 2009; Wells 2010; de Paula Couto et al. 2011; Moe et al. 2013; Torma et al. 2013; Moore et al. 2015; MacLeod et al. 2016; McKibbin et al. 2016; Lu et al. 2017; Scelzo et al. 2018; Liddell and Ferreira 2019) Good physical health (Wagnild and Young 1993; Bauman et al. 2001; Hardy et al. 2004; Hildon et al. 2008; Lamond et al. 2008; Wells 2009; Wells 2010; Moe et al. 2013; Edwards et al. 2015; Moore et al. 2015; MacLeod et al. 2016; McKibbin et al. 2016; Lu et al. 2017; Scelzo et al. 2018; Jeste et al. 2019; Liddell and Ferreira 2019) Physical activity (Clark et al. 2011; Torma et al. 2013) Mobility (MacLeod et al. 2016) Independence in activities of daily living (Hardy et al. 2004; Hildon et al. 2008; Torma et al. 2013; Silverman et al. 2015; MacLeod et al. 2016) Meaningful activity (Hildon et al. 2008; Hayman et al. 2017) Self-care (Bolton et al. 2016)
Previous exposure to stressful events	Previous adversities (Hildon et al. 2008; Bolton et al. 2016; Hayman et al. 2017)
Meaningfulness	Spiritual practice/being religious (Bauman et al. 2001; Nakashima and Canda 2005; Lee et al. 2008) Meaning/purpose in life (Nygren et al. 2005; Wiles et al. 2012; Moe et al. 2013; Edwards et al. 2015; Bolton et al. 2016; MacLeod et al. 2016) 'Counting blessings' (Wiles et al. 2012)
WITHIN RELATIONSHIPS	
Social support network	External connections (Edwards et al. 2015; Bolton et al. 2016)

	Social support (Bauman et al. 2001; Clark et al. 2011; Wiles et al. 2012; Li et al. 2015; Martin et al. 2015a; Moore et al. 2015; Frietag and Schmidt 2016; MacLeod et al. 2016; Hayman et al. 2017) Social connectedness (Ong et al. 2014) Social engagement (Silverman et al. 2015; Phillips et al. 2016) Emotional support (Liddell and Ferreira 2019)
Family	Close family relationships (Wiles et al. 2012; Edwards et al. 2015) Lives with others (Hardy et al. 2004) Family functioning (Lu et al. 2017) Social network with family (Wells 2010; McKibbin et al. 2016)
Friends	Close friendships (Wiles et al. 2012; Edwards et al. 2015) Neighbours (Wiles et al. 2012) Social network with friends (Wells 2009; Wells 2010; McKibbin et al. 2016)
WITHIN THE COMMUNITY	
Person-environment fit	'Places for growing older' (Wiles et al. 2012) Community involvement (MacLeod et al. 2016) Perceived social and economic resources (Martin et al. 2015a) Social environment resources (Nakashima and Canda 2005) Healthcare and agencies (Wiles et al. 2012)

High self-esteem was also identified as a protective factor by Windle et al. (2008). Though self-esteem and self-efficacy are often used interchangeably in research, they play two different roles in the process of resilience. While self-efficacy may play a part in determining the choice of behaviour, the success of this behaviour will affect self-esteem which in turn may influence whether that behaviour will be chosen again (Osborne 1996).

Finally, it is suggested that self-acceptance of oneself, the ageing process, and mortality, may protect against the belief that ageing is a period of decline, thus contributing to resilience (Bolton et al. 2016; Hayman et al. 2017). In their qualitative study Wiles et al. (2012) suggested that self-acceptance may be moderated by a sense of humour, as participants found that when they were faced with their limitations laughing at them was a helpful response.

3.5.3.1.3 Good psychological resources

The theme 'good psychological resources' came from nine protective factors identified by 16 studies; these were: positive self-rated health (Wagnild and Young 1993; Hardy et al. 2004), happiness (Ong et al. 2006; Fullen et al. 2018), optimism (Lamond et al. 2008; Lee et al. 2008; Edwards et al. 2015; Martin et al. 2015a; Martin et al. 2015b; Bolton et al. 2016; MacLeod et al. 2016; Lu et al. 2017), emotional regulation (Martin et al. 2015a; Hayman et al. 2017), altruism (Bolton et al. 2016), grit (Bolton et al. 2016), hope (Polson et al. 2018), morale (Wagnild and Young 1993), autonomy (Stephens et al. 2015), and satisfaction in life (Wagnild and Young 1993; Rossi et al. 2007; Fullen et al. 2018; Liddell and Ferreira 2019).

Self-rated health was found to be significantly associated with the resilience of community-dwelling older adults by Hardy et al. (2004) and their results are supported by previous studies of community-dwelling older adults (Wagnild and Young 1993), suggesting that this association is stable across generations of older adults. Similarly, greater satisfaction with life was identified as a protective factor in older adults by Wagnild and Young in 1993, and also by researchers conducting studies more recently (Rossi et al. 2007; Fullen et al. 2018; Liddell and Ferreira 2019), suggesting that this association is also stable across generations.

Optimism refers to an individual's ability to remain hopeful and optimistic of positive outcomes in the face of adversity (Bolton et al. 2016). In Martin et al.'s (2016) study optimism was found to be the third largest contributor in explaining the variance in resilience scores of older adults. Hope, defined as 'looking to the future with a sense of optimism and anticipation', is closely related to optimism and was also found to be a protective factor of

older adults' resilience by Polson et al. (2018), who found hope was a stronger predictor of resilience than social connection or physical ability.

Emotional regulation is connected to an individual's locus of control or internal processing and refers to an individual's ability to exert control over their own emotional state (Martin et al. 2015a). This ability enables an older adult to think more clearly during stressful situations (Benzies and Mychasiuk 2009) and allows them to more effectively use emotion-focused coping styles (Hayman et al. 2017). This is particularly important when control over external events is reduced and problem-focused coping options are few; such events are more common in advanced age (Hayman et al. 2017).

Three further psychological protective factors were identified by only one study. Altruism and grit were factors identified by Bolton et al. (2016). They suggested that altruism, the ability to contribute to the lives of other people, gives older adults a sense of purpose, while grit provides the determination to survive and overcome adversity (Bolton et al. 2016). Autonomy, defined as the ability to make one's own decisions, rather than relying on the decisions of others, was identified as a protective factor by Stephens et al. (2015). They proposed that retaining autonomy allows older adults to maintain control in the face of adversity, even if they depend on others to fulfil their goals (Stephens et al. 2015).

3.5.3.1.4 Good cognitive abilities

The theme of 'good cognitive abilities' was identified in four studies which found that good cognitive functioning (Lamond et al. 2008; MacLeod et al. 2016), cognitive strategies (Bauman et al. 2001), and communication skills (Martin et al. 2015a) were protective factors of older adults.

Cognitive functioning affects memory, decision-making, executive control (which is important for performing non-habitual tasks, and therefore for adapting to adversity), and communication skills (Glisky 2007). Accordingly, having good cognitive abilities, or a lack of cognitive failures, was found to be a protective factor by MacLeod et al. (2016) and Lamond et al. (2008). This is supported by Martin et al. (2015) who found that maintaining the ability to communicate with others and relate to them promotes resilience. However, the findings of Bauman et al. (2001) suggest that effective cognitive strategies may moderate the effect of worsening intellect on resilience, in particular 'denial' or not spending energy thinking about negative events enables older adults to move on to their next task, while positive self-talk can also be used by older adults to encourage themselves into activity.

3.5.3.1.5 Positive health behaviours

'Positive health behaviours' refers to an individual's mental health (Hardy et al.2004; MacLeod et al. 2016), physical health (Hardy et al. 2004; Hildon et al. 2008; Edwards et al. 2015; MacLeod et al. 2016), and physical activity (Clark et al. 2011; Torma et al. 2013). This includes their ability to mobilise (MacLeod et al. 2016), independently complete ADL (Hardy et al. 2004; Hildon et al. 2008; Torma et al. 2013; Silverman et al. 2015; MacLeod et al. 2016), participate in meaningful activity (Hildon et al. 2008; Hayman et al. 2017), and perform self-care activities (Bolton et al. 2016). Having good mental and physical health are amongst the most studied protective factors in older adults. In this review 14 studies were identified as assessing the relationship between resilience and either mental or physical health (Table 3-4).

Though physical limitations increase in old age, resilient individuals can minimise the impact of physical decline on their well-being; this is often achieved through continued physical exercise and participation in ADL (Bauman et al. 2001; Hildon et al. 2008). Hildon et al. (2008) found that resilient individuals reported almost twice as much engagement in independent leisure or domestic activities than vulnerable older adults did, and that engaging in meaningful activities following retirement was a way that the vulnerable group began to develop resilience and positively adapt.

These findings have led several literature reviews to summarise that independence in ADL, being physically active, participation in meaningful activity, and better physical health with fewer chronic conditions are associated with higher resilience in older adults (Bolton et al. 2016; MacLeod et al. 2016; Hayman et al. 2017). However, Clark et al. (2011) suggest that it is not the level of health that is important, but how it is defined and experienced by the individual. This is supported by research which has found that the relationship between ill health and lower resilience is mediated by lower well-being (Windle et al. 2010) and that older adults do not necessarily see themselves as being unwell, especially if they are diagnosed with a controllable condition they have lived with for a while (Ong et al. 2014). Additionally, Hildon et al. (2008) also found that participants with resilient outcomes did not dwell on, or talk about, health problems, while vulnerable older adults described their health as much more limiting.

The relationship between the effect of health and resilience has also been considered in relation to other protective factors. McClain et al. (2018) found that physical health was not

significantly associated with resilience; rather it mediated the relationship between self-efficacy and resilience. Additionally, MacLeod et al. (2016) found that social support mediated the effect of mental or physical illness on resilience, as neither of these predicted low resilience when social support was strong. These studies reflect the indirect model of resilience suggested by Masten and Reed (2002), as protective and vulnerability factors are shown to act as mediators.

Still, most of the resilience research has been conducted with community-dwelling older adults, and the relationship between health and resilience is understood less in other populations. For instance, hospitalisation imposes a restriction on the mobility and functional performance of older adults, often leading to functional decline (Clark et al. 2011). It is plausible then that this may result in lower resilience during or following hospital admission.

3.5.3.1.6 Previous exposure to stressful events

The effect of previous exposure to stressful events on older adults' resilience is well documented. Successfully overcoming a range of previous hardships, including loneliness, experiences with grief, and ill health are believed to contribute to the building of resilience (Bolton et al. 2016). It is suggested that this is because successful adaptation following previous adversity equips them with ways to cope, building their self-efficacy and empowering older adults to positively act in the present (Hayman et al. 2017).

In their qualitative study of older adults receiving end-of-life care, Nakashima and Canda (2005) found that story-telling facilitated this protective factor. Telling stories of their lives enabled individuals to reflect upon their past and made personal strengths come alive again. As a result they were able gain insights from their past which helped them to make sense of their current well-being and helped them to adapt to their illness. Story-telling as a means to reinterpret past events was also identified as a way of building resilience in community-dwelling older adults. Again, it was concluded that story-telling enables older adults to clarify the meaning of adverse events through the reinterpretation of past events (Hildon et al. 2008).

3.5.3.1.7 Meaningfulness

'Meaningfulness' is a theme reflected in six studies included in this review. Across these studies three protective factors led to identification of this overarching protective factor. These are: having meaning in life (Nygren et al. 2005; Wiles et al. 2012; Moe et al. 2013; Edwards et al. 2015; Bolton et al. 2016; MacLeod et al. 2016), spiritual practice (Bauman et

al. 2001; Nakashima and Canda 2005; Lee et al. 2008), and 'counting blessings' (Wiles et al. 2012).

In older adults having a sense of meaning or purpose provides a motivation to be resilient, to manage and adapt to adversity (Wiles et al. 2012). Furthermore, it is suggested that an individual's sense of purpose does not necessarily diminish during the process of ageing, as Nygren et al.'s (2005) study found that older adults' sense of purpose was comparable to that of younger adults. Meaningfulness has also been found to strongly relate to other protective factors, such as one's social network, optimism, and positive health behaviours, which includes participation in meaningful activities (Wiles et al. 2012; Edwards et al. 2015). An example of this is provided by Nakashima and Canda (2005) who found that religious beliefs motivated a person to engage in meaningful religious activities, such as prayer.

Bolton et al. (2016) also recognise a link between meaningfulness and spirituality, stating that a sense of meaning can be created by the individual or can come from faith and religious grounding. Religious beliefs can sustain an individual's attitude towards life, thus providing structure to their sense of purpose and a contribution to their well-being which is external from the adversity that they face (Wiles et al. 2012). At the end of life spiritual beliefs can also provide meaning in death and ease the tension between resilience and 'surrendering to death' (Nakashima and Canda 2005).

3.5.3.2 Protective factors within relationships

Studies which investigated the protective factors of older adults within relationships tended to broadly assess the effect of social support on resilience. Nine studies investigated this relationship (Table 3-4); there was a consensus between them that the greater an individual's social support network, the better their resilience was.

One of the widespread myths of old age is that older adults are lonely and isolated, often due to bereavement. However, research has shown that in general the size of an individual's social network is quite stable over their lifespan, as is frequency of social contact (Staudinger et al. 1995). Furthermore, older adults do not report feeling lonelier than younger adults do, and often report greater satisfaction with their social support network (Staudinger et al. 1995).

Nevertheless, in older adults greater resilience is associated with a greater amount of formal support (Netuveli et al. 2008), closer social relationships which are able to provide both social

and emotional support (Hildon et al. 2008; Liddell and Ferreira 2019), and the ability to recognise the availability of support (Hildon et al. 2008). Phillips et al. (2016) and Silverman et al. (2015) also suggest that greater social engagement increases resilience, however this finding is disputed by Hildon et al. (2008) who state that the frequency of social engagement may not play a role on older adults' resilience (Hildon et al. 2008).

In Martin et al.'s (2015a) study having access to a social support network explained 9.7% of the variance in older adults' resilience scores. Social support can be informal or formal, emotional or physical, and provides companionship, support, advice, and advocacy (Bolton et al. 2016; Hayman et al. 2017). Ong et al. (2014) warn against social support being seen as unidirectional. Relationships are not based solely on receiving support but also on maintaining social connections and fulfilling social roles, such as being a supportive grandparent or confidante, even if the individual becomes dependent on others to manage everyday life (Ong et al. 2014). Additionally, if social support is to be a protective factor it needs to be present before and during the adversity, rather than being a result of it (Netuveli et al. 2008).

A few studies specifically looked at the differential effect of social support from family and from friends on resilience. Family functioning, defined as 'the ability of the family to adapt to stress, share decision making, and support and nurture one another in a loving relationship' was found to be a significant protective factor in older adults' resilience. It is proposed that this may be due to older adults feeling like they are not going through adversity alone if they are supported by a well-functioning family (Lu et al. 2017). Somewhat similarly, Hardy et al. (2004) found that living with others had a significant positive affect on older adults' resilience, though the same relationship was found to be non-significant in studies by Li et al. (2015) and Liddell and Ferreira (2019). Wiles et al. (2012) also found that adult children were identified as a source of support. However, their participants felt that their adult children were less dependable than friends due to them 'having their own lives' (Wiles et al. 2012). Contrarily, friends were seen as being more available, better at cheering a person up, and people to 'bounce things off' (Wiles et al. 2012). Bauman et al. (2001) also recognised that many of their participants' friendships had been acquired in recent years, often through attending senior centres or other organised activities. Neighbourliness was also recognised as a protective factor, as neighbours could provide both practical support but also the sense of a safe and warm community (Wiles et al. 2012).

3.5.3.3 Protective factors within the community

The theme 'person-environment fit' (PE fit) is reflected in four studies; they refer to 'places for growing older' (Wiles et al. 2012), community involvement (MacLeod et al. 2016), perceived social and economic resources (Martin et al. 2015a), social environment resources (Nakashima and Canda 2005), and healthcare and agencies (Wiles et al. 2012).

In older age having a good PE fit enables an older adult to 'age in place', which refers to an older adult living in the community with some level of independence (Davey et al. 2004), and protects against adversity. The 'fit' is supported by the ability to physically access community resources, including local amenities (such as shops and public transport); having support from high-quality health and social services, including doctors, nurses as well as other services and agencies (e.g. meals on wheels); and being able to engage in community life (Wiles et al. 2012; MacLeod et al. 2016). Recognising the importance of this fit leads some older adults to state that there may be a requirement to move to a new residence to maintain it (Wiles et al. 2012).

However, PE fit does not refer simply to the suitability of the physical environment. Moving to a new house to support better physical PE fit may also bring about a vulnerability factor, as social networks are changed and the sense of familiarity or 'belonging' in a place is lost (Wiles et al. 2012). Furthermore, the requirement to 'start again' in a new place can require energy and resources that older adults are unable to provide (Wiles et al. 2012). One participant of Wiles et al.'s (2012) study suggested that he would prefer to shop online should he become unable to leave the house, rather than move to a more convenient location.

For older adults receiving hospice care having a good PE fit is also reflective of both physical and social resources. In Nakashima and Canda's study (2005) the caregiving setting had to be equipped to provide physical comfort, however the individual's relationship with their primary caregiver was key to utilising all possible environmental resources. Consequently, while PE fit is an important protective factor in older adults, it needs to be considered not just at the physical level but also at the social level.

3.5.4 Vulnerability factors of older adults

As with the rest of resilience literature, protective factors and processes have received most of the focus in resilience research with older adults. This is clear when looking at literature

reviews focused on the resilience of older adults (e.g. MacLeod et al. 2016; Hayman et al. 2017), and is due to the understanding that resilience interventions should focus on enhancing protective factors, rather than reduce vulnerability factors, to improve resilience (Lee et al. 2013). It is suggested that this is partially due to the predominant focus on resilience at the individual level, as the identification of, and focus on, vulnerability factors at this level may place a degree of blame on the older adult (Wiles et al. 2012), or be more difficult to diminish (e.g. clinical frailty (Gijzel et al. 2017)).

Nevertheless, a few studies have investigated vulnerability factors of older adults. These have generally focused on the negative effect that health conditions have on older adults' resilience, in order to identify who may benefit from resilience interventions. A list of commonly identified vulnerability factors in older adults can be seen in Table 3-5.

Table 3-5: Vulnerability factors of older adults

Vulnerability Factors
WITHIN THE INDIVIDUAL
Depression/Depressive symptoms (Wagnild and Young 1993; Mehta et al. 2008; Hardy et al. 2004; Li et al. 2015; Lim et al. 2015; Silverman et al. 2015; Freitag and Schmidt 2016; Lu et al. 2017; Carandang et al. 2019)
Anxiety (Freitag and Schmidt 2016)
Stress (Ong et al. 2006; Rossi et al. 2007; Moore et al. 2015)
Number of illnesses/dysfunctions (Windle et al. 2010; Liu et al. 2018),
Severity of the condition (Lie et al. 2018)
Self-perceived poor health (Hildon et al. 2008)
ADL impairment (Polson et al. 2018)
Frailty (Freitag and Schmidt 2016; Rebagliati et al. 2016; Gijzel et al. 2017)
Impaired cognitive functioning (Lamond et al. 2008)
Childhood adversity (Phillips et al. 2016)
WITHIN RELATIONSHIPS
Loneliness (Kuwert et al. 2014; Li et al. 2015)
Being childless/receiving limited support from children (vs having supportive children) (Phillips et al. 2016)

The majority of these vulnerability factors were identified in community-dwelling older adults. However, in a population of older adults receiving acute hospital care following a

stroke, Liu et al. (2018) also found that being an atheist (rather than being religious), having a lower monthly income, number of traumatic experiences, and receiving care from either a carer or themselves (rather than from a family member), and having an attitude of resignation were vulnerability factors.

Nonetheless, the list of recognised vulnerability factors in older adults is short and is affected by context (take the example of 'dependency in ADL' from Sections 3.3.1 and 3.5.2 for instance). Furthermore, it is often assumed that the absence of a protective factor constitutes a vulnerability factor, and, while this may be true on occasions, it is not a rule. Consequently, there is a call for further investigation into the vulnerability factors associated with older adults' resilience.

Identification of vulnerability factors would enable further testing of resilience processes, as they may mediate the relationship between a protective factor and a resilient outcome. This would provide additional context for the testing of resilience theory and provide more evidence on which to base resilience interventions (Bolton et al. 2016).

3.5.5 Consequences of resilience in older adults

Consistent with broader resilience theory, resilience in older adults is understood to lead to effective coping, mastery, and positive adaptation enabling the individual to manage and adapt well in the face of adversity (Earvolino-Ramirez 2007).

However, resilience research which follows a variable-focused approach, and generally uses a quantitative method, tends to use a resilience scale as the outcome measure (e.g. Nygren et al. 2005; Lee et al. 2008; Wells 2010). Where quantitative studies have included resilience as an independent variable, outcome measures have assessed SA (Lamond et al. 2008; Moore et al. 2015; Fullen et al. 2018), life satisfaction (Rossi et al. 2007), quality of life (Lu et al. 2017), and mental well-being (Scelzo et al. 2018).

The alternative, person-focused, approach tends to use qualitative research methods. Accordingly, participants tend to be recruited based on their outcomes, which are assumed to be reflective of resilience, and then studied to determine the factors that make them resilient. Some of the 'resilient outcomes' that participants have been selected upon are reporting good health despite health conditions (Ong et al. 2014) and quality of life following adversity (Hildon et al. 2008).

Given that having a good quality of life is consistently found to be associated with resilience in quantitative research (e.g. Li et al. 2015; Frietag and Schmidt 2016; Lu et al. 2017), and is used to identify resilient individuals for qualitative research, it is generally accepted as the main outcome of resilience, though it is varyingly referred to as 'a better quality of life', 'improved life satisfaction', or 'flourishing' when compared to vulnerable individuals (Hildon et al. 2010; Hicks and Conner 2014). This outcome makes resilience relevant to all older people, as a good 'quality of life' can be achieved regardless of ill health (Hicks and Conner 2014).

3.6 Conclusion

Resilience is 'the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma. Assets and resources within the individual, their life and environment facilitate this capacity for adaption and "bouncing back" in the face of adversity' (Windle 2011, p. 163). This definition makes clear that for resilience to be observed an individual must face a significant adversity that poses a real risk of a negative outcome (Windle 2011; Schwarzer and Warner 2013). Furthermore, resilience research is uncompromising in its recommendation that any findings are considered solely within the context of that specific adversity (Vanderbilt-Adriance and Shaw 2008).

Consequently, Windle (2011, p. 159) suggests that resilience research needs to ask the following three questions:

….. a) What is the risk or adversity?
b) Which assets/resources might offset the effect of the adversity?
c) Is the outcome better than could be expected (comparing with a group of individuals not at risk, or comparing on the presence or absence of the assets/resources)?

In this chapter 'old age' was considered as a context for resilience research (Hayman et al. 2017). A number of assets and resources have been identified through resilience research which may be protective factors of older adults. At the individual level these encompassed: positive self-perceptions, positive psychological resources, good cognitive abilities, positive health behaviours, previous exposure to stressful events, meaningfulness, and good material resources. A small number of social assets and community resources were also identified in the literature; these included having a good social support network, including both family

and friends, and experiencing good PE fit.

Across each level, the protective factors identified are reflective of the term 'ordinary magic' used to describe resilience by Masten (2001). This term reflects resilience as a product of unremarkable characteristics and supports the belief that all individuals are capable of being resilient (Masten 2001). This is echoed by the general consensus that quality of life, or improved well-being, is the primary outcome of resilience, which can also be achieved regardless of ill health (Wagnild 2003; Rossi et al. 2007; Hildon et al. 2010; Hicks and Conner 2014). Similarly, vulnerability factors, though they are less studied, are not considered extraordinary characteristics.

Despite it being understood that the process of resilience emerges from the interplay between the adversity, the person, and the environment (Johnson and Wiechelt 2004; Wild et al. 2013), the investigation of older adults' protective individual assets dominates current literature, while social assets or community resources are less frequently studied. This is concerning as a focus on individual factors could cause vulnerable individuals to feel responsible for their lack of resilience (Wiles et al. 2012). Alternatively, an increased focus on the effect of physical and social environmental factors would enable the development of environments which facilitate resilience, and would make it a concept more useful to geriatric practice.

A further limitation of current geriatric resilience research is that the majority of it has been conducted with community-dwelling older adults. This is an issue as it is recommended that resilience should be investigated in the context of a specific adversity given the highly individual and contextual nature of adversities, protective factors, and vulnerability factors (Vanderbilt-Adriance and Shaw 2008). Therefore, research conducted with older adults living independently, and potentially in good health, may not be applicable to older adults experiencing very different adversities (Hoare 2015). This has led to a call for resilience research with older adults who are experiencing more acute ill health, are disabled, or are institutionalised (Hardy et al. 2004; Windle et al. 2010).

Though there is a dearth in resilience research with these populations, far more research has looked at the protective factor of self-efficacy with various populations of older adults. As self-efficacy is understood to be a key resilience resource, the following chapter discusses the role self-efficacy plays in the health and resilience of older adults, and explores how self-efficacy may contribute to our understanding of resilience across care settings.

Chapter 4 Self-Efficacy

4.1 Introduction

Recently geriatric resilience research has focused on identifying and understanding the particular stressors associated with old age and has investigated the resilience resources that enable older adults to cope with these adversities (Gyurcsik and Estabrooks 2004; Jopp and Rott 2006; McAuley et al. 2006). These studies demonstrate consistently that self-efficacy is a powerful resilience resource which empowers older adults to cope with age-associated stressors that can affect both their mental and physical health (Schneller and Vandsburger 2008).

Self-efficacy is an innate resource and refers to the belief that individuals have in their own abilities to cope with daily struggles, adapt to stressful life events, and complete tasks successfully (Schwarzer 1992). While 'general self-efficacy' refers to an individual's overall belief in their ability to 'succeed' (Schwarzer and Jerusalem 1995), task-specific forms of self-efficacy can also be measured; examples in geriatric research include 'falls self-efficacy' (Yardley et al. 2005) or 'self-efficacy to manage chronic disease' (Lorig et al. 2001).

The aim of this chapter is to review current understandings of self-efficacy, particularly self-efficacy in older adults (Section 4.2.1), and its role as a resilience resource (Section 4.5). Presented in this chapter is a systematic review and meta-analysis[1] that assesses whether the general self-efficacy of older adults is affected by the receipt of healthcare, and whether it varies across healthcare settings (Section 4.4). Finally, this chapter critically analyses the systematic review and meta-analysis, and discusses the implications of it to the current research (Section 4.6).

[1] This systematic review and meta-analysis was published online by The Gerontologist on 6th May 2020.

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4.2 Conceptualising self-efficacy

In 1977, Bandura defined self-efficacy as an individual's perception of their effectiveness in overcoming adversity. Later, self-efficacy was redefined as an individual's perception of their ability to achieve a goal (Bandura 1994). More recently, Resnick (2014) stated that self-efficacy is 'the motivation and belief to bring about a specific goal in a certain context or situation'; this definition echoes the contextual and shifting nature of self-efficacy.

Self-efficacy influences human functioning and well-being through cognitive, motivational, affective, and selective processes (Bandura 1994; Hamill 2003). A central aspect of self-efficacy is the belief that the individual can exert control over the outcomes of events in their life (Hamill 2003). This reflects an optimistic and self-confident belief of being able to deal with certain stressors in life (Schwarzer and Warner 2013). Consequently, when facing adverse events, those who have higher self-efficacy are more likely to persevere due to their belief that they will be able to exert control over their situation (Ozer and Bandura 1990; Hamill 2003). This sense of control enables greater persistence, successful adaptation, and development of competence (Aspinwall and Richter 1999). Without self-efficacy there would be little incentive to persevere in the face of adversity, as there would be little hope for success.

Bandura (1997) proposed that an individual's self-efficacy is enabled by four mechanisms: successful performance of the activity of interest (mastery experiences), positive verbal encouragement from an appropriate person (verbal persuasion), having a 'role-model' to emulate (vicarious experiences), and the individual's physical and emotional states. Maddux (2013) suggested a fifth mechanism by which self-efficacy could be bolstered, he labelled this 'imaginal experiences', referring to the act of visualising success in performing an action before attempting it in real life. Furthermore, Bandura (1997) states that self-efficacy beliefs can be characterised by three dimensions: a) level (magnitude), b) strength, and c) generality.

The first dimension, level, refers to how difficult the task is, as varying demands and task difficulties require varying levels of self-efficacy (Schwarzer and Warner 2013). The second dimension, strength, refers to how robust the self-efficacy beliefs are; weak beliefs are easily swayed by failures in achieving the desired outcome (Schwarzer and Warner 2013). Finally, generality refers to how broad an individual's self-efficacy beliefs are; low generality of self-efficacy would indicate a belief that one is capable in only a few behaviours.

4.2.1 Self-efficacy in older adults

Self-efficacy is an important intrinsic resilience resource for older adults (Schneller and Vandsburger 2008). With major life changes, such as loss of productive roles (e.g. retirement) or loss of friends and spouses, as well as potentially decreasing physical and intellectual (e.g. memory) capabilities, older adults' perception of ageing can often focus on their declining abilities (Bandura 1994). As a result, older adults' sense of self-efficacy may also decline, and can be subject to reappraisal and misappraisal. However, self-efficacy is also able to withstand the role and environmental changes associated with old age, and older adults who maintain strong self-efficacy are able to reshape and maintain a productive life amongst these life changes (Dietz 1996; Jopp and Rott 2006). Indeed, it has previously been found that older adults can demonstrate greater levels of self-efficacy than younger generations (Dietz 1996).

While mastery experiences improve self-efficacy beliefs in most individuals, this is particularly important in older adults. McAuley et al. (2006) found a reciprocal relationship between self-efficacy and physical activity; older adults who felt capable of succeeding in physical activities were more likely to engage in them. This in turn increased their self-efficacy, which then promoted further activity. Additionally, individuals with high levels of self-efficacy tend to see adversities as challenges rather than threats, further promoting mastery experiences (Schwarzer and Warner 2013).

In comparison, the self-efficacy of older adults is less dependent on feedback from exterior sources. Jopp and Rott (2006) found that social influences had a weaker effect on older adults' self-efficacy than on younger adults' self-efficacy. It may be concluded, therefore, that older adults' self-efficacy is enabled primarily through successful performance of an activity, their judgement of task performance, and their physical and emotional states (Bandura 1997).

In geriatric research there has been a focus on the GSE of older adults, as it is understood to encompass all self-efficacy beliefs that individuals develop throughout their entire life history (Watt and Martin 1994), and has been found to predict older adults' quality of life (Bowling and Iliffe 2011). Additionally, developing ways to improve older adults' GSE are proposed as a means to reduce adverse outcomes, thus increasing their healthy life expectancy and reducing lifetime healthcare expenditures (Suhrcke et al. 2008; Fried 2011; He et al. 2015; Santo and Daniel 2018).

This research has consistently found that older adults with lesser GSE limit their involvement in ADL and reduce their efforts in activities they do complete (Easom 2003). In contrast, those with a greater level of GSE are more proactive in seeking health information, engaging in self-care behaviours, making health modifications, and adhering to treatment (Rodin 1986; Easom 2003; Kostka and Jachimowicz 2010; Stadtander et al. 2015).

Easom (2003) also identified barriers to older adults' GSE; these included lack of family support, fear, fatigue, lack of willpower, environmental or financial pressures, or negatively, and incorrectly, appraising their own abilities. Frailty may also obstruct older adults' GSE as Doba et al. (2016) found that there was a significant negative relationship between self-efficacy and frailty in this population.

4.3 Self-efficacy in clinical practice

Regarding health and healthcare services, self-efficacy has been found to be associated with the healthcare use of older adults, measured as the frequency of GP visits, of appointments with specialist outpatient centres, and of hospitalisations and visits to an emergency department (Scherer and Bruce 2001; Bock et al. 2018). These associations appear to be specific to older adults, as a study by Wysocki et al. (1992) recruited younger adult participants and found no relationship between self-efficacy and healthcare use. This is also supported by Bandura (1994), who suggested that as individuals age self-efficacy beliefs become increasingly influenced by declining health.

The decision to attend a healthcare service incorporates multiple factors. The primary factor is an individual's perception of their own health; that it is poor enough to warrant doing so. However other factors include the individual's perception of how well they are able to cope, as well as their preferences, values, and emotions (Bock et al. 2018). Illness perception has also been found to influence self-efficacy; in other words, when the perceived consequences of ill health are higher, self-efficacy is reduced (Lau-Walker 2004).

Across care settings self-efficacy has been found to negatively associate with depression, anxiety, and stress (Paukert et al. 2010; Tung et al. 2012; Lewin et al. 2013, Curtis et al. 2014), while positively associate with quality of life and physical function (Mystakidou et al. 2010a, 2015; Tung et al. 2012). It has also been identified that individuals with high self-efficacy are

less likely to become unwell and recover better and faster from illnesses (Gecas 1989). It is, therefore, of importance that self-efficacy is considered and addressed by the healthcare services that aim to promote well-being and independence. Self-efficacy is particularly relevant for healthcare professionals as it has been promoted as an operative construct, that is, it is related to subsequent behaviour and, therefore, is relevant for clinical practice (Jones et al. 2009; Schwarzer 1992; Tousignant et al. 2012). However, while it has been indicated that increased health problems may reduce self-efficacy, it has also been suggested that increased contact with healthcare services may undermine older adults' GSE (Rodin 1986). Specifically, it is suggested that the frequency or length of contact with the healthcare services may strengthen this negative effect (Bandura 1982; Woodward and Wallston 1987); though lack of access to health services can also be a severe impediment to self-efficacy (Bandura 2000).

Current research has investigated the GSE of older adults receiving different levels and forms of healthcare provision in order to ascertain whether GSE interventions may improve the quality of life and healthy ageing of older adults experiencing ill health (Kostka and Jachimowicz 2010; Bonsaksen et al. 2012; Mystakidou et al. 2015; Cybulski et al. 2017). Several studies have also investigated the difference in the GSE between populations of 'healthy older adults' and 'older adults receiving care', with the intention of identifying whether specific populations have lower GSE and should be the first focus of intervention (Kim et al. 2006; Kostka and Jachimowicz 2010; Schmidt et al. 2014; Cybulski et al. 2017). However, very little research has investigated whether there is any effect of the healthcare setting on the GSE of older adults, despite it being understood that the design of care settings may influence a range of patient health outcomes (Ulrich et al. 2008).

Only one study has investigated the difference in levels of GSE between older adult populations receiving care in different healthcare settings. This study suggested that the form of healthcare an older adult receives may influence their level of GSE, with participants receiving acute inpatient care having lower GSE than individuals receiving rehabilitative or long-term care (Barder et al. 1994). Given that this is the sole study to investigate the GSE of older adult populations between care settings, it has not yet been determined whether these patterns are consistent across broader populations of older adults receiving care. Moreover, it would be inadvisable to generalise the findings of Barder et al.'s (1994) study as their

participants were predominantly male (86%) and were recruited from care facilities within the Department of Veteran Affairs.

4.3.1 Measuring self-efficacy

Much of the literature previously cited has measured the GSE of older adults. General self-efficacy is understood to be a situation-independent competence belief, a universal construct (Scholz et al. 2002; Scherbaum et al. 2006), referring to a global confidence in one's coping ability across a wide range of situations (Schwarzer 1992; Schwarzer and Jerusalem 1995). However, according to Resnick (2014) self-efficacy is a situation-specific competence belief. Therefore, some argue that self-efficacy measures should be task-specific and should measure self-efficacy in particular situations of functioning (Bandura 1997).

Assessments of self-efficacy, therefore, fall into two categories: those which measure task-specific self-efficacy (TSSE) and those which measure general self-efficacy.

Numerous studies have found that GSE and TSSE are positively correlated (e.g. Sherer et al. 1982, Leganger et al. 2000; Dullard 2014). Eden (2001) argues that GSE is a determining factor of TSSE, while other authors have suggested that GSE moderates the association between the environment and individuals' TSSE (Scherbaum et al. 2006).

Scholz et al. (2002) argue that the use of TSSE measures and GSE measures should be determined by the research question or the purpose of measuring self-efficacy. If the aim is to predict specific outcomes (e.g. smoking cessation in relation to self-efficacy to stop smoking) and allow researchers to focus on the level and strength of self-efficacy in specific scenarios then task-specific measures of self-efficacy would be more appropriate (Leganger et al. 2000; Schwarzer and Warner 2013). If global constructs are to be predicted, such as anxiety, depression, or resilience, then a more general measure of self-efficacy is more adequate to serve as a predictor (Schwarzer and Warner 2013).

Previously, those in contention to GSE measures have criticised their ability to reliably measure the construct. However, a study by Scherbaum et al. (2006) found that the three most commonly used GSE measures, i.e. the Generalized Self-Efficacy Scale (GSES) (Schwarzer and Jerusalem 1995), the Self-Efficacy Scale (SES) (Sherer and Adams 1983), and the New General Self-Efficacy Scale (NGSES) (Chen et al. 2001), all demonstrate significant relationships with the unidimensional, latent construct of GSE. In terms of assessing the

universality of GSE, the GSES has been confirmed as a reliable measure of GSE across 25 nations (Scholz et al. 2002).

4.4 The general self-efficacy of older adults receiving care: a systematic review and meta-analysis.

4.4.1 Purpose of systematic review and meta-analysis

General self-efficacy is understood to impact upon older adults' participation in ADL, resilience, ability to make health modifications, and adjustment to ill health (Rodin 1986; Easom 2003; Kostka and Jachimowicz 2010; Stadtander et al. 2015). Accordingly, interventions focused on enhancing older adults' GSE have been identified as having the potential to develop clinical practice and improve patient health outcomes. However, it is recognised that GSE may be altered by the receipt of healthcare services and the environment in which they are received (Rodin 1986; Ulrich et al. 2008).

Previous research has focused on the effectiveness of GSE interventions, however little attention has been paid to the difference in GSE between older adult populations receiving care in different healthcare settings. In recognition of this, a systematic review and meta-analysis was conducted to:

- Determine whether older adults who receive healthcare services have lower GSE than those who do not.
- To investigate whether older adults receiving healthcare services are at risk of having lower GSE based on the environment in which care is received.
- To identify variables that are frequently correlated with the GSE of older adults in each healthcare setting.

4.4.2 Methods

4.4.2.1 Search Procedure

In September 2019, a systematic search of electronic peer-reviewed databases was conducted through EBSCOhost, Elsevier, ProQuest, and the Cochrane Library. This included: MEDLINE (EBSCOhost), PsycINFO (EBSCOhost), CENTRAL (Cochrane Library), CINAHL

(EBSCOhost), Scopus (Elsevier), Abstracts in Social Gerontology (EBSCOhost), and ASSIA (ProQuest).

Searches were conducted using terms relevant to GSE, older adults, and healthcare services. Key words followed the PICOS principals, including:

> Population: 'elder*' or 'elderly people' or 'older adults' or 'older people' or 'aged' or 'aged, 80 and over' or 'geriatric*'.
>
> Intervention: 'hospital' or 'nursing home' or 'institutionali*' or 'rehabilitation'.
>
> Outcomes: 'self-efficacy' or 'self efficacy' or 'efficacy beliefs' or 'control' or 'subjective well-being'.

A date restriction of post-2000 was applied as it is difficult to generalise historical geriatric research to a population of today's older adults due to consecutive generations of older adults appearing strikingly different (Rodin 1986; Pew Research Centre 2015). These differences are often the result of unique historical circumstances or changing demographics and attitudes that members of a specific age cohort experience (e.g. wars, social movements, economic booms or busts, global pandemics, scientific or technological breakthroughs), particularly during a time when they are in the process of forming opinions (Pew Research Centre 2015). Searches of reference lists were conducted using studies eligible after full-text screening.

4.4.2.2 Eligibility Criteria

This review included both observational and interventional study designs, providing they presented the mean score and standard deviation (SD) of the GSE scale used.

Participants were required to be 'receiving care at the time of assessment', this was determined differently across the study settings. Where studies pertained to inpatient or outpatient care, data collection was required to take place either during inpatient admission or during an outpatient clinic/course. Studies related to nursing homes were required to recruit participants who were residing permanently within the establishment. Finally, where studies recruited individuals from primary care providers (PCPs) participants were required to have 'regular' contact with their PCP. Decisions as to whether studies met these criteria were made in consideration of the purpose of the study, the study procedure, and information provided regarding the participants.

The most recent findings of the European Social Survey (Abrams et al. 2011) found that the average perceived start of old age was 62 years (range: 55.1-68.2). Accordingly, each study population included in this review had to have a lower 95% confidence interval (CI) of at least 60 years old. No exclusion criteria limited the participants by gender, clinical diagnosis, length of care or the type of care being received, assuming it was reported and could be categorised into 'inpatient care', 'outpatient care' or 'community care'.

Studies which used either the GSES (Schwarzer and Jerusalem 1995), SES (Sherer and Adams 1983) or NGSES (Chen et al. 2001) were eligible for inclusion in this review, as each of these measures demonstrate significant relationships with the latent construct of GSE (Scherbaum et al. 2006).

Finally, eligible studies had to be published in peer-reviewed journals and written in English.

4.4.2.3 Study Selection and data extraction

Full details of the search are provided in the PRISMA diagram (Figure 4-1). Titles and abstracts of all identified articles were reviewed against inclusion criteria. After the exclusion of articles following title and abstract screening, this process was then repeated reviewing full papers. This process resulted in the identification of 40 papers eligible for inclusion in this review.

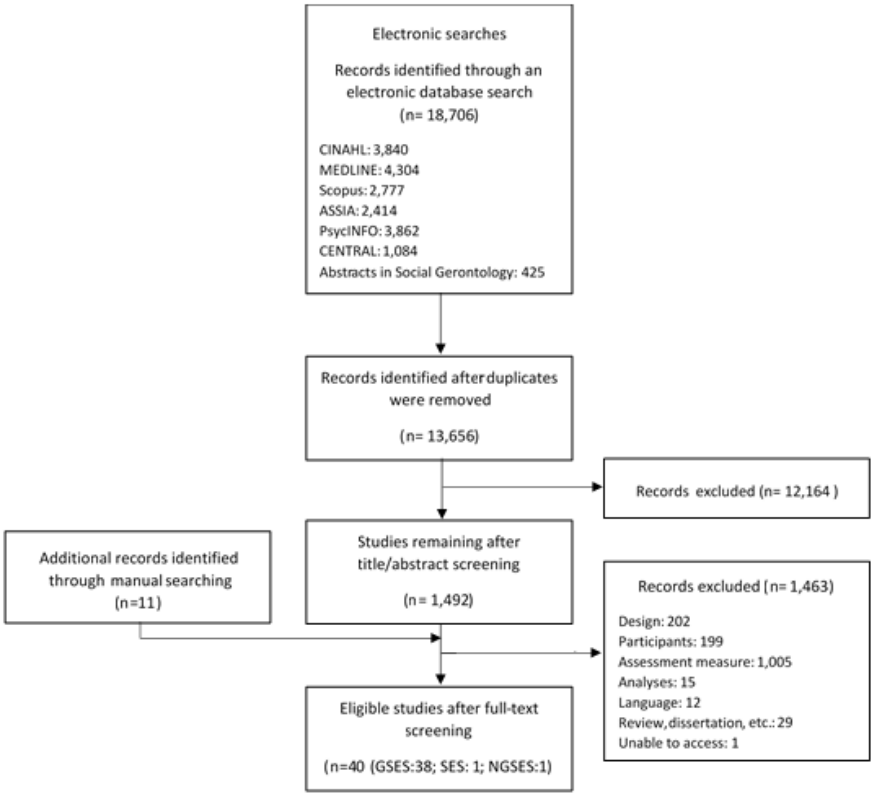

Figure 4-1: PRISMA diagram for study selection

Data from the included papers were then extracted using a pre-piloted form adapted from the Joanna Briggs Extraction Form for Experimental and Observation Studies (Joanna Briggs Institute 2014). This form comprised of five sections: general information, study design, participant characteristics, GSE measure and score, and bivariate outcome data.

4.4.2.4 Risk of Bias Assessment

Quality assessment of studies should use tools specific to their study designs (Harrison et al. 2017). As such, the included studies were assessed for bias using the appraisal instruments outlined in Table 4-1.

Studies were classified as having high, moderate, or low risk of bias, in relation to their respective study designs. This classification is included in Table 4-2. Funnel plots of publication bias were not created due to the expected heterogeneity resulting from the descriptive, observational nature of most studies (Terrin et al. 2003).

Table 4-1: Risk of bias appraisal instruments for included studies

STUDY DESIGN	ASSESSMENT INSTRUMENT
Cross-sectional	Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart, Lung and Blood Institute 2014)
Observational cohort	
Before-After with no control group	Quality Assessment Tool for Before-After (Pre-Post) Studies with No Control Group (National Heart, Lung and Blood Institute 2014)
Randomised controlled trial	Risk of Bias Tool (Cochrane Collaboration 1976)
Controlled before-after	Risk of Bias Tool (Cochrane Collaboration 1976)
Mixed methods	Mixed Methods Appraisal Tool (Pluye et al. 2011)
Secondary analysis of existing data	The REporting of Studies Conducted using Observational Routinely-collected Health Data Statement (Benchimol et al. 2015)

4.4.2.5 Data Synthesis

Information regarding each study characteristic was extracted and systematically organised in a tabular format (Table 4-2).

Studies that compared the GSE between older adults receiving care versus non-care were meta-analysed in Stata (StataCorp 2019) using standardised mean differences (SMD) (also known as Cohen's d) (Figure 4-2). A SMD of zero would demonstrate that older adults

receiving care and not receiving care had comparable GSE. If the SMD value is negative, the results indicate that older adults without care have greater GSE. Furthermore, Cohen stated that a SMD of 0.2 should be interpreted as a small effect, a SMD of 0.5 as a medium effect, and a SMD of 0.8 as a large effect (Cohen 1988). In this meta-analysis, the precision of the studies' effect estimates determined the weight given to the SMD of each study.

To compare the GSE of older adults across different healthcare settings, mean GSES scores (and standard deviations) from individual studies were pooled using Stata. Pooled scores were created for 'inpatient', 'outpatient', and 'community' care settings (Figure 4-3). Mean scores were weighted based on the precision of each studies' estimate (the narrowness of the confidence interval).

Studies that recruited participants from inpatient wards, either acute medical or rehabilitative wards, were grouped together as inpatient care. Studies that recruited participants from outpatient clinics or educational clinics were grouped under outpatient care. Studies which recruited permanent residents of nursing homes were grouped under community care with studies concerning PCPs. This grouping of nursing homes reflects current literature regarding the provision of care within nursing homes: firstly, that any medical or rehabilitative care residents receive is primarily provided by community care services (e.g. community physiotherapists, or general practitioners) (Ribbe et al. 1997; Ghavarskhar et al. 2018; Charles 2019), and secondly, that nursing home residents are increasingly being seen as active members of communities (Tak et al. 2015).

The literature search identified only one study which used the NGSES (Chen et al. 2005) and six which used the SES (Sherer and Adams 1983); as a result these were only included in the meta-analysis of SMD as the small number of studies meant that pooled mean scores for these measures could not be calculated across healthcare settings.

The bivariate relationships presented between GSE and other study outcomes were unable to be meta-analysed due to the different outcome measures used and the lack of studies which have investigated whether they measure the same underlying constructs. Instead, individual study results are displayed and discussed.

4.4.2.6 Missing Data

Eligible studies recruited 'older adults', which was determined by a mean age and lower 95% confidence interval of at least 60 years old. The lower 95% confidence intervals were

calculated using the mean age and the SD of each sample, using the formula $\bar{x} \pm 1.96\left(\frac{\sigma}{\sqrt{n}}\right)$, where $\bar{x}$ is the sample mean, σ is the SD, and n is the sample size (Lane 2020).

All but one study reported their sample age as a mean with the SD. Carlstedt et al. (2015) reported the mean age and the age range of their participants. To ensure that this study met the inclusion criteria the SD of the sample mean was estimated using the range rule for SD ($\sigma \approx \frac{b-a}{4}$, where a is the minimum value and b is the maximum value (Ramírez and Cox 2012)). Estimating the SD enabled the lower confidence interval for the mean age to be estimated also.

Eligible studies also had to report the GSE scale score of their participants. Mean GSE scale scores with standard deviations were required to carry out the meta-analyses. All the included studies provided this data; consequently, no further imputation of missing data was required.

4.4.2.7 Assessment of Heterogeneity

A fixed-effects model was not appropriate for this meta-analysis as it would require included studies to be homogenous, that is to investigate one population and use the same outcome measure (Terrin et al. 2003). Instead, a random-effects model was applied given the clinical and methodological heterogeneity across the included studies (Terrin et al. 2003). For the meta-analysis of SMD, the I^2 and Chi square statistics for heterogeneity were calculated.

4.4.2.8 Sensitivity Analysis

Sensitivity analysis was performed using subgroup and leave-one-out analysis. Leave-one-out analysis is performed by omitting one study at a time to measure its individual effect on the pooled estimate of the rest of the studies (Viechtbauer and Cheung 2010). This leave-one-out analysis also enabled the examination of outliers and influential statistics, thus identifying sources of heterogeneity.

No further sensitivity analysis was carried out through the exclusion of studies according to their sample size or methodological quality. Instead, it was deemed that heterogeneity resulting from the inclusion of studies with small sample sizes, or with reduced methodological quality, would be identified through the leave-one-out analysis. Furthermore, if cross-sectional studies had been excluded there would have been insufficient data to conduct the meta-analysis.

Table 4-2: Characteristics of the 40 included studies

STUDY	COUNTRY	CARE SETTING	DIAGNOSIS	NUMBER OF PARTICIPANTS WHO COMPLETED GSE MEASURE	% OF MALES	AGE (SD) [YEARS]	SELF-EFFICACY MEASURE/ BASELINE SCORE	RISK OF BIAS
Barnes-Harris et al. (2019)	UK and Australia	Outpatient clinics	Chronic breathlessness	41	59%	70.5 (5.17)	Secondary data analysis of Johnson et al. (2016) and Swan et al. (2019)	Moderate
Bonsaksen et al. (2012)	Norway	Patient Education Course	COPD	86	53%	64.4 (9.7)	GSES 27.6 (6.4)	Moderate
Bonsaksen et al. (2013)	Norway	Patient education course	COPD	60	53%	64.5 (9.4)	Same data as Bonsaksen et al. (2012)	Moderate
Bonsaksen et al. (2014)	Norway	Patient education course	COPD Obese group excluded due to age	56	58.9%	66.3 (9.1)	Same data as Bonsaksen et al. (2012)	Low
Carlstedt et al. (2015)	Sweden	Outpatient Clinic	Stroke	34	61.8%	68.1	GSES 31.7 (6.95)	Moderate
Curtis et al. (2014)	Ireland	Rapid Access Prostate Hospital Clinic	Prostate Cancer	89	100%	64.62 (8.02)	GSES 30.6 (5.64)	Low

Cybulski et al. (2017)	Poland	Nursing Home	-	300 (Nursing Home = 100)	29% (overall)	60+	GSES Nursing Home: 24.38 (7.67) Community: 29.71 (3.88)	Low
Fan and Lv (2016)	China	Acute hospital cardiovascular wards	Chronic Heart Failure	159	47%	63 (13.5)	GSES 26.11 (6.459)	Low
Feldstain et al. (2016)	Canada	Outpatient Palliative Rehabilitation	Stage 3/4 Cancer	80	47.5%	64.04 (12.5)	GSES 27.86 (6.16)	Low
Fors et al. (2018)	Sweden	Acute inpatient hospital	COPD and/or chronic heart failure	221 (intervention group = 103)	Intervention: 50.5% Control: 41.5%	Intervention: 78.3 (9.5) Control: 76.9 (8.3)	GSES Intervention: 28.1 (6.5) Control: 28.5 (5.8)	Unclear
Fu et al. (2018)	China	Nursing Homes	-	307	29.3%	60+	GSES 27.93 (5.6)	Low
Ghielen et al. (2017)	Nether-lands	Outpatient Clinic	Parkinson's disease	19	55%	66.6 (8.4)	GSES 28.5 (4.56)	Low
Haugland et al. (2016)	Norway	NET centres (outpatient)	Neuro-endocrine tumours	196	49.5%	65 (11)	GSES 29.9 (5.5)	Low
Huygens et al. (2017)	Nether-lands	General Practices	Chronic Illness	627	49.9%	65.1 (11.6)	GSES 3.12 (0.6)	Low
Iannello et al. (2018)	Italy	Inpatient rehabilitation	Hip fracture	42 (intervention group =21)	28.5%	Intervention: 79.95 (8.93) Control:	GSES Intervention: 34.1 (7.5)	Unclear

						79.31 (9.12)	Control: 32.7 (7.4)	
Johnson et al. (2016)	UK and Australia	Outpatient clinics	Refractory breathlessness	49 (intervention group = 24)	Intervention: 50% Control: 56%	Intervention: 68.5 (11.6) Control: 67.7 (8.7)	GSES Intervention: 30.2 (5.8) Control: 32.0 (4.4)	Low
Kim et al. (2006)	Korea	'Institution-alised'	-	214 (institution-alised = 106)	Institutionalised: 54.7% Non-insitituation-alised: 41.7 %	65+	SES Institutionalised: 3.01 (0.44) Non-institutionalised: 3.29 (0.42)	Low
Kosmat and Vranic (2017)	Croatia	Residential Care Home	-	22 (intervention group = 12)	25% overall	Intervention: 80.08 (6.156) Control: 79.08 (3.615)	GSES Intervention: 3.3 (0.44) Control: 3.1 (0.56)	Unclear
Kostka and Jachimowicz (2010)	Poland	Nursing Home	-	224 (nursing home = 112)	Nursing Home: 22.3% Veterans Home: 21.5% Community: 23.6%	Nursing Home: 78.9 (6.9) Veterans Home: 77 (7.6) Community: 69.6 (4.6)	GSES Nursing Home: 30.4 (7) Community: 30.9 (5.5)	Low
Lai et al. (2018)	Hong Kong	Nursing Homes	-	96	34.4%	84.6 (7.24)	GSES 21.55 (7.47)	Moderate

Lewin et al. (2013)	Germany	Inpatient Neurological Rehabilitation	Stroke	96	52%	67.08 (10.55)	Same data as Volz et al. 2018	Moderate
Liu et al. (2018)	China	Inpatient neurology wards	Ischemic Stroke	147	63.3%	68.57 (6.73)	GSES 25.6 (5.8)	Low
Magklara and Morrison (2016)	UK	Pre-surgery educational clinic	Pre-joint replacement	53	33.3%	69.33 (8.57)	GSES 31.19 (5.2)	Moderate
Mystakidou et al. (2008)	Greece	Inpatient palliative care unit	Palliative Cancer	99	40.4%	63.1 (14)	Same data as Mystakidou et al. 2010a	Low
Mystakidou et al. (2010a)	Greece	Inpatient palliative care unit	Palliative Cancer	99	40.4%	63.5 (13.2)	GSES 28.29 (6.9)	Low
Mystakidou et al. (2010b)	Greece	Outpatient Radiotherapy	Cancer	90 (male = 41) Female group excluded due to age	45.6%	Male: 65.63 (12.48) Female: 57.45 (13.83)	GSES Male: 33.17 (4.9)	Low
Mystakidou et al. (2012)	Greece	Outpatient Palliative Care	Cancer Chronically ill group excluded due to age	107	51.4%	64.52 (12.84)	GSES Cancer: 25.73 (6.0)	Low

Mystakidou et al. (2013)	Greece	Outpatient Radiotherapy	Cancer	90	45.6%	61.17 (5.2)	Same data as Mystakidou et al. 2010b	Low
Mystakidou et al. (2015)	Greece	Outpatient Palliative Care	Palliative Cancer	115	52.2%	64.84 (12.7)	GSES 26.01 (6.11)	Low
Neuman et al. (2019)	USA	Inpatient hospital ward	Hip fracture	20	25%	72 (10.96)	GSES 32.8 (6.2)	Moderate
Rotenberg Shpigelman et al. (2019)	Israel	Geriatric clinics	Subjective memory complaints	91 (receiving care = 51)	Care receivers: 45.1% Not receiving care: 32.5%	Care receivers: 79.98 (7.33) Not receiving care: 78.28 (7.4)	NGSES Care receivers: 23.4 (6.1) Not receiving care: 26.4 (3.7)	Low
Schmidt et al. (2014)	Germany	Outpatient Memory Clinic	Mild Cognitive Impairment	53 (Mild Cognitive Impairment = 26)	Mild Cognitive Impairment: 46.7% Cognitively healthy: 47%	Mild Cognitive Impairment : 72.5 (5.8) Cognitively healthy: 73.1 (7.0)	GSES Mild Cognitive Impairment: 28.5 (5.1) Cognitively healthy: 33.7 (5)	Low
Schulz et al. (2015)	Germany	Primary Care	Osteoarthritis	1,018	31.1%	74.9 (5.17)	GSES 32.7 (5.9)	Moderate
Stadtlander et al. (2015)	USA	Primary Healthcare	-	35	17.1%	88.4 (3.12)	GSES 31.3 (4.6)	Moderate
Strupeit et al. (2013)	Germany	Inpatient Geriatric Rehabilitation	Mobility impairment	124 (intervention group = 39)	Intervention: 87.2% Control: 32.9%	Intervention: 83.72 (6.87) Control: 83.44 (8.71)	GSES Intervention: 25.97 (5.13)	Moderate

							Control: 26.1 (6.25)	
Susanto et al. (2019)	Indonesia	'Institutional care'	Hypertension	64	59.4%	71.86 (9.94)	GSES 27.88 (6.59)	Moderate
Swan et al. (2019)	UK	Outpatient clinics	Chronic breathlessness	40	70%	72 (9.8)	GSES 31.03 (5.85)	Low
Tousignant et al. (2012)	Canada	Geriatric Day Hospital	Falls	152 (intervention group = 76)	Intervention: 25% Control: 29%	Intervention: 79.1 (6.4) Control: 80.7 (6.0)	GSES Intervention: 27.7 (6.2) Control: 29.2 (5.4)	Low
Volz et al. (2016)	Germany	Neurological Inpatient Rehabilitation	Stroke	88	54.5%	66.35 (10.7)	Same data as Volz et al. 2018	Low
Volz et al. (2018)	Germany	Neurological Inpatient Rehabilitation	Stroke	294	58.9%	63.78 (10.83)	GSES 31.25 (5.98)	Low

4.4.3 Outcomes

The search of online databases in September 2019 identified 18,706 publications. Following the exclusion of duplicates and the screening of titles and abstracts, 1,492 studies proceeded to full-text screening, a further 11 records were identified through manual searching of reference lists. Of these, 1,462 failed to meet the specified selection criteria, and one article was not accessible. The primary reason for exclusion was due to the assessment measure used; these primarily measured TSSE (e.g. exercise self-efficacy). In total 40 studies were eligible for this review (Figure 4-1).

4.4.3.1 Study characteristics

Study characteristics are reported in Table 4-2. Publication dates of the selected studies ranged from 2004 to 2019, with data from populations in the USA, Canada, Asia, Europe, and Australia. Studies included 33 different population cohorts, with sample sizes ranging from 19 to 1,018 participants and mean age between 63 and 88 years. One study recruited males only, in other studies the proportion of males varied from 17.1% to 63.3%. Cross-sectional analysis was used in 23 studies, eight studies were randomised controlled trials (RCTs), three were cohort studies, four were pre-post studies with no control group, one study was a controlled, non-randomised, before-after study, and one followed a convergent mixed-methods design.

4.4.3.2 Participants

A total of 4,731 participants receiving healthcare services were included in the review. Of these 49% received community care, 23.4% received inpatient care and 24% received outpatient care; 3.6% of participants were described as 'institutionalised'.

4.4.3.3 Self-efficacy measures

One study used the SES (Sherer and Adams 1983), 38 studies used the GSES (Schwarzer and Jerusalem 1995), and one study used the NGSES (Chen et al. 2001).

4.4.3.4 Risk of Bias

Of the 40 studies, 25 were rated as having a 'low risk of bias', 12 were given a rating of 'moderate risk of bias', and three studies did not provide enough details to award a rating and so were categorised as having an 'unclear' risk of bias. These ratings are displayed in Table 4-2.

The majority of studies included in this review were of a cross-sectional design; most were deemed to have a 'low risk of bias' due to high participation rates, use of defined recruitment criteria and standardised outcome measures, and controlling of potential cofounders. Due to the study design there was also no loss to follow up. Studies that received 'moderate risk of bias' ratings tended to not present discussion around its sample size, recruited less than 50% of eligible individuals or did not control for cofounders.

Within the cohort and pre-post studies, the greatest risk of bias came from loss to follow up. Percentages of loss ranged from <20% (Mystakidou et al. 2013; Volz et al. 2016) to >50% (Bonsaksen et al. 2014; Neuman et al. 2019). Studies accounted for loss to follow up through multiple imputation (Feldstain et al. 2016), average imputation (Bonsaksen et al. 2013; Bonsaksen et al. 2014), and/or listwise deletion when data were deemed to be missing at random (Bonsaksen et al. 2013; Bonsaksen et al. 2014; Neuman et al. 2019). Volz et al. (2018) adopted a continuous time perspective in which missing longitudinal data were translated into a problem of unequal time intervals.

Eight RCTs were included in this review. Of these six stated their study design and group characteristics in enough depth to determine that there was low risk of selection bias (Tousignant et al. 2012; Ghielen et al. 2017; Fors et al. 2018; Johnson et al. 2018; Lai et al. 2018; Swan et al. 2019). The studies by Kosmat and Vranic (2017), Iannello et al. (2018) and Fors et al. (2018) were found to be of 'unclear' risk of bias due to lack of detail regarding the randomisation of participants and concealment of the groups.

With regards to performance bias three RCTs did not blind their participants (Ghielen et al. 2017; Johnson et al. 2018; Swan et al. 2019), while four were unable to blind personnel as they were delivering the interventions (Tousignant et al. 2012; Kosmat and Vranic 2017; Johnson et al. 2018; Swan et al. 2019). Regarding detection bias, only two studies blinded their outcome assessors (Tousignant et al. 2012; Lai et al. 2018). Finally, two studies did not report details regarding the blinding of either their participants or their outcome assessors (Fors et al. 2018; Iannello et al. 2018).

The RCTs are, therefore, at various risks of performance or detection bias. However, use of functional performance measures, and measures that required the self-report of blinded participants, reduced the risk of bias in each study. This is similar in the quasi-experimental study by Strupeit et al. (2013). Additionally, the studies by Johnson et al. (2018) and Swan et al. (2019) were feasibility trials and so the authors judged that their lack of blinding was not

likely to influence the outcome of the studies as the source of bias would be consistent across study arms. Furthermore, the aim of the studies was to measure the variability of response to measures to inform a further RCT (Johnson et al. 2018; Swan et al. 2019).

Finally, the included convergent mixed methods study (Stadtlander et al. 2015) was of appropriate design for its research aims and had a response rate of 100%. However, the sampling strategy resulted in few participants and the effect of the achieved sample size on the quantitative portions of the study was not discussed, increasing the risk of selection bias.

4.4.4 Results

4.4.4.1 The GSE of older adults and receipt of healthcare services

Five studies investigated the difference in GSE between a population of older adults receiving healthcare services, and a population of older adults who were not receiving care.

Pooling study effects demonstrated statistically significantly lower GSE in older adults receiving healthcare services than in older adults not receiving care (SMD= -0.62, CI: -0.96 to -0.27, p<0.0001; n=5, № receiving care: 395, № without care: 385) (Figure 4-2).

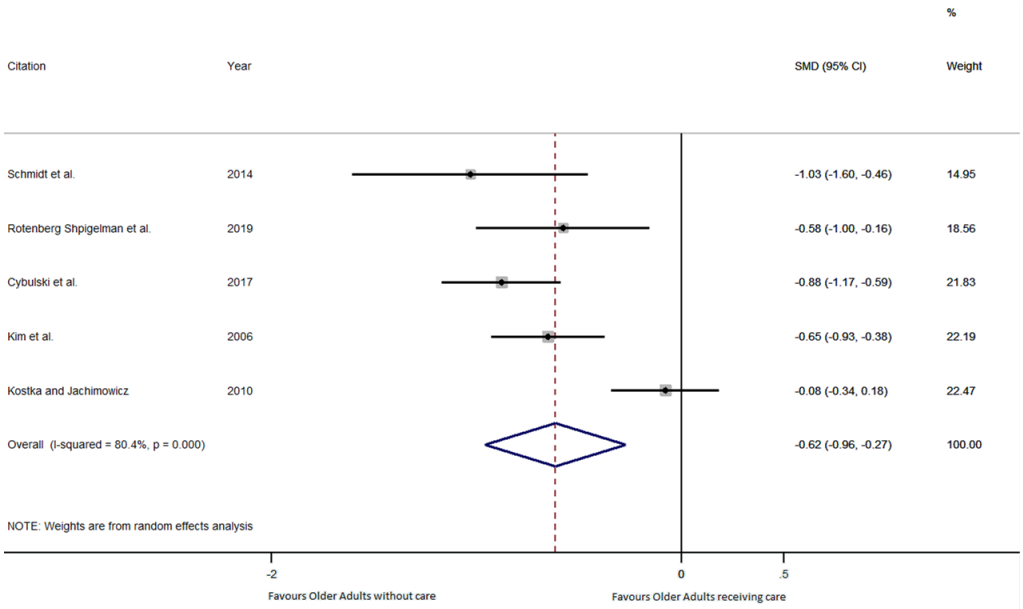

Figure 4-2: Forest plot demonstrating significantly lower GSE in older adults receiving care relative to older adults who are not receiving care.

4.4.4.2 The GSE of older adults across different healthcare settings

Thirty-one eligible studies used the GSES and published the mean scores of their participants. Nine studies recruited participants receiving community care, eight recruited participants receiving inpatient care, and 14 recruited participants receiving outpatient care, their GSES scores were pooled and forest plots produced (Figure 4-3). Reference lines were fixed at 30 as it is suggested that a GSES score of less than 30 is indicative of low self-efficacy (Haugland et al. 2016).

Across all three settings the pooled mean score was similar, being only very slightly higher in older adults receiving outpatient care (29.34 (28.19, 30.49)), compared to older adults receiving inpatient (28.83 (26.93, 30.74)) and community care (28.75 (26.66, 30.83)) (Table 4-3).

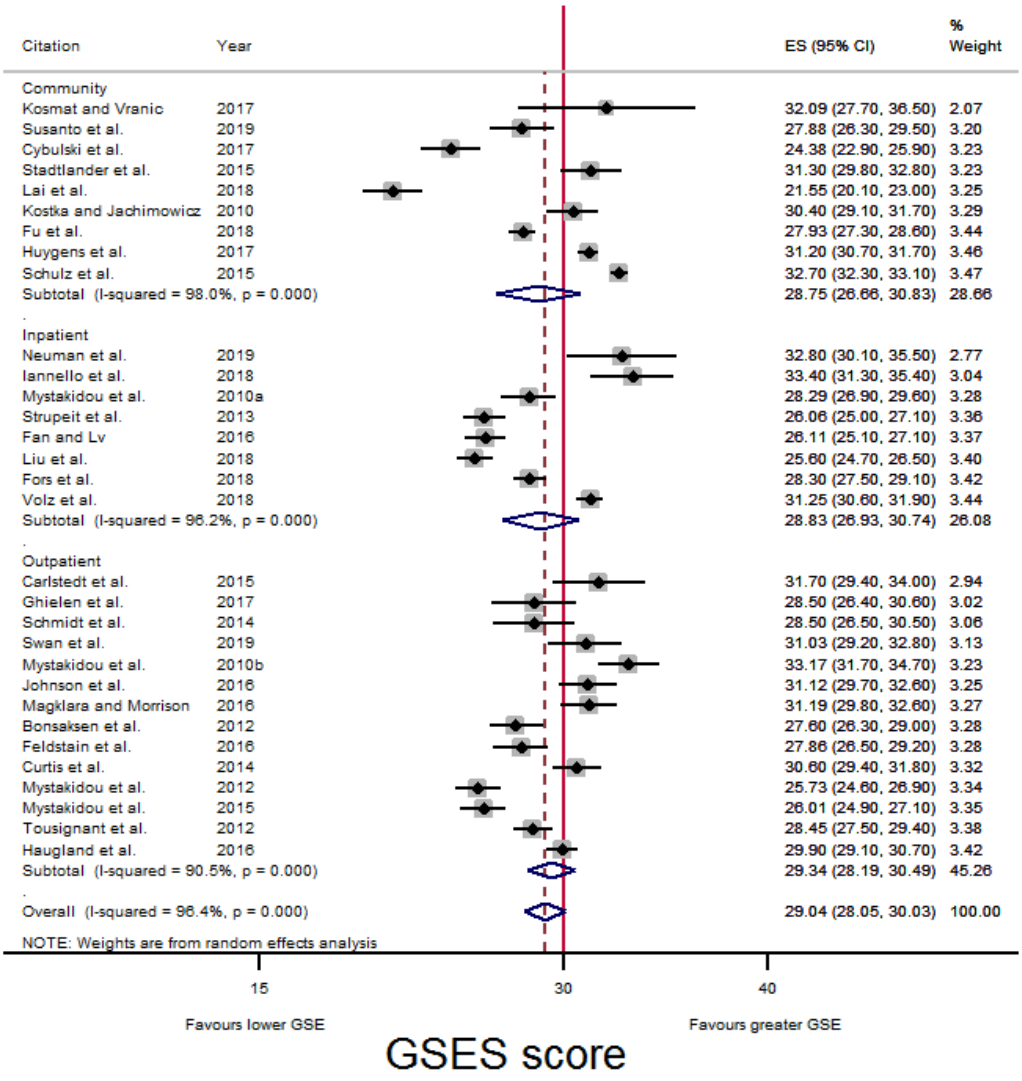

Figure 4-3: Forest plot: Comparison of GSES scores across three care settings

Table 4-3: GSES scores in various care settings at different stages of analysis

	INITIAL META-ANALYSIS			SUBGROUP ANALYSIS		POST LEAVE-ONE OUT ANALYSIS	
SETTING	**n**	**MEAN (95% CI)**	**SETTING**	**n**	**MEAN (95% CI)**	**n**	**MEAN (95% CI)**
Community	2,381	28.75 (26.66, 30.83)	Nursing Homes	701	27.13 (24.55, 29.70)	701	27.13 (24.55, 29.70)
			Primary Care Providers	1,680	31.80 (30.59, 33.00)	1,680	31.80 (30.59, 33.00)
Inpatient	1,106	28.83 (26.93, 30.74)	Acute Medical	626	27.05 (25.61, 28.50)	527	26.68 (24.96, 28.41)
			Rehabilitation	480	30.77 (27.39, 34.15)	356	32.17 (30.64, 33.70)
Outpatient	1,087	29.34 (28.19, 30.49)	Clinic	948	29.33 (28.05, 30.61)	605	29.93 (29.08, 30.78)
			Education	139	29.39 (25.87, 32.91)	139	29.39 (25.87, 32.91)

However, there was significant heterogeneity between studies, and as studies had been grouped broadly, subgroup analysis was carried out. Six subgroups were formed, with studies grouped into those which recruited participants from nursing homes, PCPs, acute inpatient wards, inpatient rehabilitation wards, outpatient clinics, or educational courses.

Following subgroup analysis (Figure 4-4) older adults receiving care provided by PCPs had the greatest GSES score (31.80 (30.59, 33.00)), followed by inpatients in a rehabilitation ward (30.77 (27.39, 34.15), then those attending education courses (29.39 (25.87, 32.91)), then those attending an outpatient clinic (29.33 (28.05, 30.61)), followed by residents of nursing homes (27.13 (24.55, 29.70)) and, lastly those receiving acute medical inpatient care (27.05 (25.61, 28.50)) (Table 4-3).

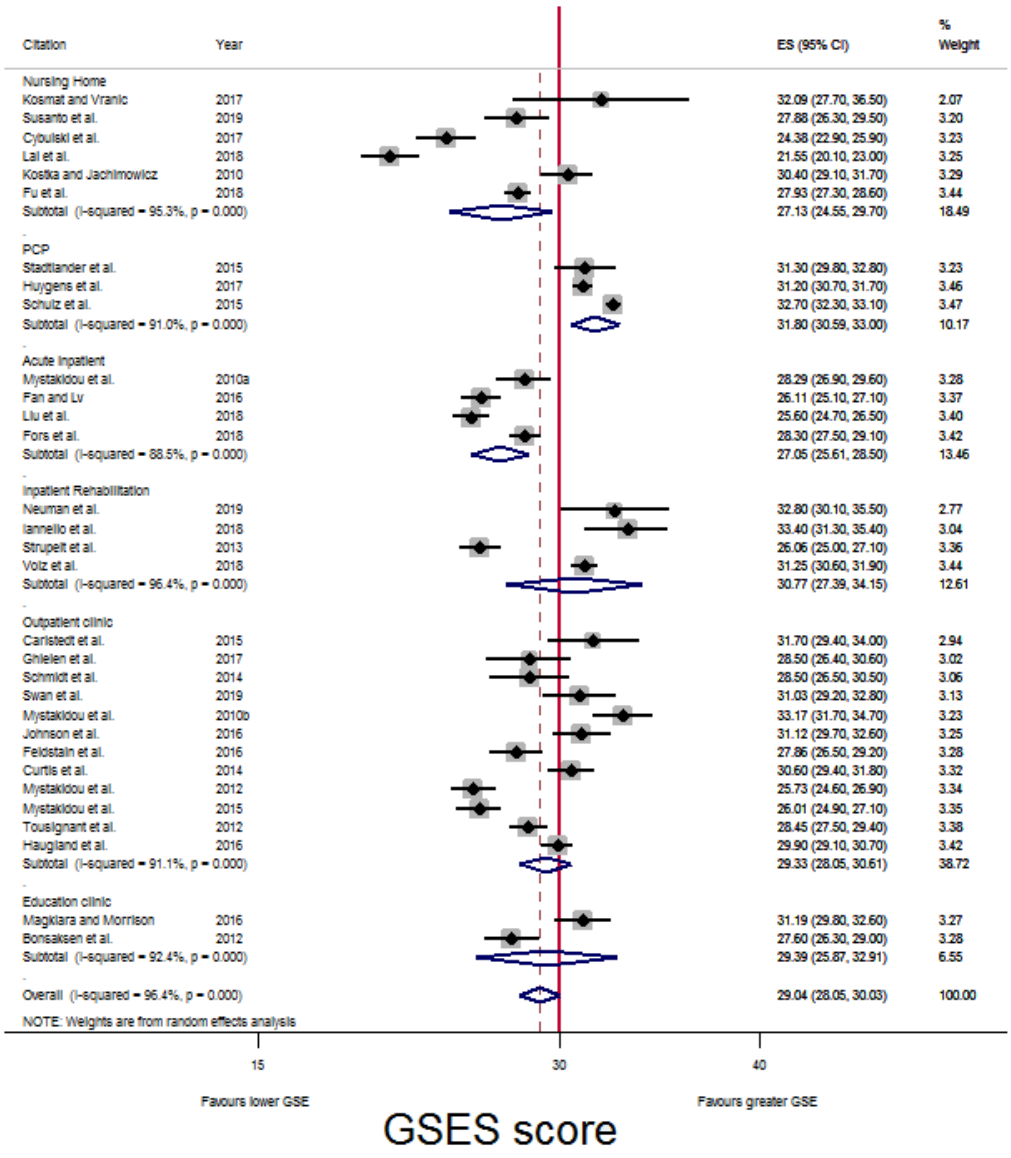

Figure 4-4: Forest plot: Comparison of GSES scores across six subgroup care settings

Following subgroup analysis, significant heterogeneity continued to be observed in each healthcare setting. Leave-one-out analysis was performed to measure each study's individual effect on the pooled estimate of the studies. Leave-one-out analysis could not be carried out with the educational course subgroup, due to only two studies being included.

Following leave-one-out analysis (Figure 4-5) older adults receiving inpatient care in a rehabilitation ward had the greatest GSES score (32.17 (30.64, 33.70)), followed by those attending their PCPs (31.80 (30.59, 33.00)), then those attending an outpatient clinic (29.93 (29.08, 30.78)), then those attending an educational course (29.39 (25.87, 32.91), then

residents of nursing homes (27.13 (24.55, 29.70)) and, lastly those receiving acute medical inpatient care (26.68 (24.96, 28.41)) (Table 4-3). Additionally, there was no overlap in 95% confidence intervals for pooled GSES scores between acute medical inpatient care and inpatient rehabilitation care, outpatient clinic care, or PCPs. Studies conducted in nursing homes and educational courses continued to demonstrate considerable heterogeneity.

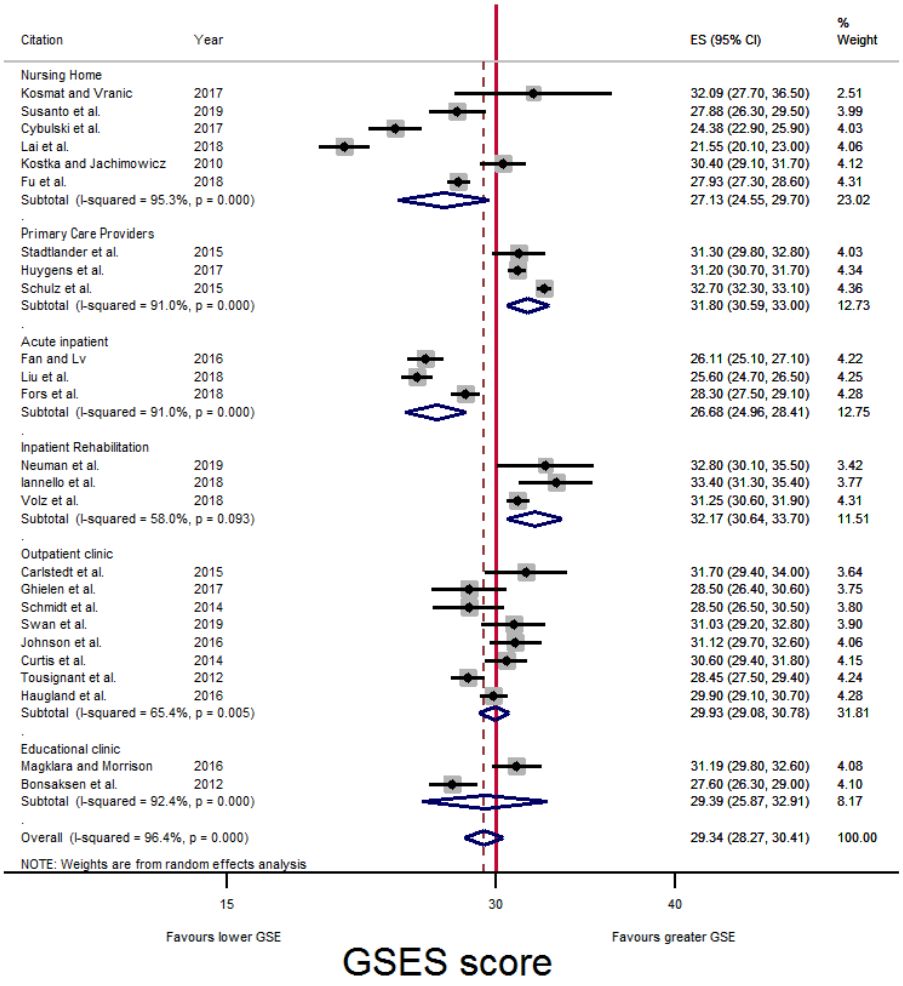

Figure 4-5: Forest plot: Comparison of GSES scores across six care settings following leave-one-out analysis

4.4.4.3 Variables associated with older adults' GSE

Meta-analysis was not conducted with variables that were found to associate with the GSE of older adults receiving healthcare services. Instead, these relationships are summarised below and displayed in Tables 4-4 and 4-5, with correlation coefficients where available. Where correlation coefficients were not reported, but the significance of the association was,

a tick mark (✓) has been used to signify a significant relationship, while a cross mark (X) denotes a non-significant relationship.

4.4.4.3.1 Demographic variables

Across healthcare settings there was little evidence that GSE is associated with older adults' demographic factors. The relationships between GSE and age, gender, employment, education, relationship status, and social support were all assessed in multiple studies (Table 4-4). For each variable there was no consistent indication that they were significantly associated with older adults' GSE.

The only demographic factor that was found to be related to GSE in more than 50% of studies it was measured in was social support (three of four studies found a significant association (Paukert et al. 2010; Lewin et al. 2013; Fu et al. 2018)), where those with greater social support had greater GSE. However, three studies found that there was no significant relationship between GSE and relationship status.

Five studies investigated the association between gender and GSE. Though this association was only found to be significant in two studies, both indicated that women were at greater risk of having lower GSE (Mystakidou et al. 2010a; Stadtlander et al. 2015).

4.4.4.3.2 Health status

Regarding mental health status, greater scores on depression, anxiety, and stress measures were found to significantly associate with lower GSE in all of the studies they were measured in (Table 4-5). Poorer scores on mental health-related quality of life (HRQoL) scales were found to significantly associate with lower GSE in the majority (66.6%) of the studies it was measured in.

Physical health variables were less consistently associated with GSE (Table 4-5). However, a significant positive correlation was found between physical HRQoL and GSE in 60% of studies, while better physical functioning was found to be associated with greater GSE in 50% of studies, improved illness perception was also found to be associated with better GSE in 33% of studies.

Table 4-4: Reported bivariate relationships between GSE and demographic variables.

		AGE	GENDER	EMPLOYMENT	EDUCATION	RELATIONSHIP STATUS	SOCIAL SUPPORT
OUTPATIENT CARE	**EDUCATION COURSE**						
	BONSAKSEN ET AL. (2012)	-0.09	-0.14	0.01	0.04	0.06	0.15
	MAGKLARA AND MORRISON (2015)	-0.06					
	OUTPATIENT CARE						
	CURTIS ET AL. (2014)	0.05					
	HAUGLAND ET AL. (2016)	-0.10*					
	MYSTAKIDOU ET AL. (2010B)	-0.01					
	MYSTAKIDOU ET AL. (2015)[2]	-0.15	✗		-0.08	✗	
INPATIENT CARE	**ACUTE HOSPITAL**						
	MYSTAKIDOU ET AL. (2010A)[2]	0.14	✓*			✗	
	REHABILITATION						
	LEWIN ET AL. (2013)	-0.12					0.46**
	STRUPEIT ET AL. (2013)[2]	✗	✗		✗		
COMMUNITY CARE	**PRIMARY CARE**						
	PAUKERT ET AL. (2010)	0.02					0.20**
	STADTLANDER ET AL. (2015)[2]		✓**		0.33*		
	NURSING HOME						
	CYBULSKI ET AL. (2017)	-0.41***					
	FU ET AL. (2018)						0.44**
	KOSMAT AND VRANIC (2017)[2]	✗					

** p<0.05; ** p<0.01; *** p<0.001*

[2] - Article did not present correlation coefficients for all/some variables

✓ - Significant association reported without correlation coefficient, ✗ - Non-significant association reported without correlation coefficient

Table 4-5: Reported bivariate relationships between GSE and health status variables.

		DEPRESSION	ANXIETY	STRESS	COGNITIVE FUNCTIONING	PHYSICAL FUNCTIONING	ILLNESS PERCEPTION	PHYSICAL HRQoL	MENTAL HRQoL
OUTPATIENT CARE	**EDUCATION COURSE**								
	BONSAKSEN ET AL. (2014A)							0.12	0.26*
	BONSAKSEN ET AL. (2012) [z]						✓[†]		
	MAGKLARA AND MORRISON (2015) [z]					0.10	✗		0.42**
	OUTPATIENT CARE								
	CURTIS ET AL. (2014)	-0.51***	-0.50***	-0.50***					
	HAUGLAND ET AL. (2016)							0.016*	
	MYSTAKIDOU ET AL. (2010B)	-0.50***				-0.29			
	MYSTAKIDOU ET AL. (2012) [z]		✓**						
	MYSTAKIDOU ET AL. (2015) [z]			✓***		✓*			
	ROTENBERG SHPIGELMAN ET AL. (2019)							0.67***	
INPATIENT CARE	**ACUTE HOSPITAL**								
	MYSTAKIDOU ET AL. (2010A) [z]		-0.46**			✓***			
	REHABILITATION								
	LEWIN ET AL. (2013)				0.39**				
	STRUPEIT ET AL. (2013) [z]				✗			✓*	✗
COMMUNITY CARE	**PRIMARY CARE**								
	PAUKERT ET AL. (2010)	-0.42**	-0.37**				0.05	0.04	
	NURSING HOME								
	KOSTKA AND JACHIMOWICZ (2010) [z]							✓***	

** p<0.05; ** p<0.01; *** p<0.001*

[z] - Article did not present correlation coefficients for all/some variables

[†] - 6 of 8 subscales were significant at p<0.05, all were negatively correlated with self-efficacy

✓ - Significant association reported without correlation coefficient, ✗ - Non-significant association reported without correlation coefficient

4.4.5 Discussion

4.4.5.1 Summary of results

The meta-analysis of SMD highlighted a significant difference between the GSE scores of those receiving care and those who did not receive healthcare services. This supports the theory that GSE is contextual and may be influenced by the level and form of healthcare an older adult is receiving.

The findings of the meta-analysis also suggest that the environment in which care is received may have an impact on older adults' GSE. When comparing across care settings, the mean scores demonstrated that older adults receiving acute inpatient care had the GSE. Furthermore, this was significantly lower than older adults receiving care from PCPs, inpatient rehabilitation facilities or outpatient clinics.

While Haugland et al. (2016) suggest a GSES score of less than 30 is indicative of a low GSE score of clinical significance, Schwarzer (2014) recommends that levels of GSE are determined based on the empirical distributions of a particular reference population. In this analysis the mean GSES score for all older adults receiving care, following leave-one-out analysis, was 29.34 (28.27, 30.41). The GSES scores of older adults receiving care from PCPs or inpatient rehabilitation facilities were significantly higher than the score of the entire population, and were the only groups to demonstrate a 'normal GSE' level according to Haugland et al.'s (2016) recommendation. This was not the case for the other care settings, where mean GSES scores fell below 30, though GSES score confidence intervals overlapped with the confidence interval of the entire population.

4.4.5.2 Self-efficacy in acute care

The findings of this meta-analysis support the work of Barder et al. (1994) who found that individuals receiving acute inpatient care services are at risk of having poorer GSE than those receiving community care.

While conducted in an inpatient rehabilitation facility, the results of Iannello et al. (2018) also support the idea that an inpatient hospital admission may reduce an older adult's GSE, as their participants who received standard inpatient care had a reduction in GSE between admission and discharge. It is proposed that there are four primary implications of being an inpatient in an acute hospital on GSE: a reduction in the sense of control, less engagement with social networks, increased risk of illness, and greater stress.

Following the experience of an unexpected admission to hospital, and increased reliance on healthcare professionals, older adults receiving inpatient care may perceive an increased inability to cope with and adapt to stressful life events, thus reducing their GSE. Barder et al. (1994) support this suggestion, as they concluded that individuals receiving acute inpatient care had reduced preference for control over healthcare than older adults receiving care in other settings.

The Healthcare Financial Management Association also suggest that receiving acute hospital care makes it more difficult for older adults to maintain social networks, and increases their risk of becoming unwell, particularly with a hospital-acquired infection (Healthcare Financial Management Association 2019), while de Sá Dias et al. (2015) suggest that patients in inpatient care settings may have greater levels of stress than patients in other care settings. These may also have an impact on the GSE of older adults receiving acute inpatient care as social support (Paukert et al. 2010; Lewin et al. 2013; Fu et al. 2018), physical ill health (Kostka and Jachimowicz 2010; Mystakidou et al. 2010a; Strupeit et al. 2013; Mystakidou et al. 2015; Haugland et al. 2016) and stress (Curtis et al. 2014; Mystakidou et al. 2015) have been found to be associated with the GSE of older adults. These relationships are discussed further in the following section.

4.4.5.3 General self-efficacy, demographic and health-related factors

Recent research has investigated the relationships between demographic and older adults' GSE, suggesting that it is likely to be affected by factors such as age, relationship status, and education (Hur 2018). The studies included in this review do not support this judgement. Several studies included in this review assessed the relationships between GSE and demographic factors, including age, gender, education, relationship status, and social support; only social support was found to be significantly related to GSE in over half of the studies it was investigated in (Table 4-4).

While the narrative synthesis found no conclusive relationships between GSE and demographic factors, both the narrative synthesis and leave-one-out analysis identified various health-related factors that may explain the relationship between the healthcare setting and older adults' GSE.

Firstly, the narrative synthesis of variables associated with older adults' GSE found that depression, anxiety, and stress are consistently negatively correlated with GSE. Consequently, an explanation for the observed differences in GSE between settings may be

that older adults receiving care in different settings are at greater or lesser risk of depression, anxiety, or stress. Though conducted in only two inpatient acute units, a study by de Sá Dias et al. (2015) does suggest that the level of patient stress may vary between care settings, as stressors such as pain, unfamiliar noises, having nurses moving around your bed, and hearing people talking about you may be more common in inpatient settings than in outpatient or community settings. However, there is currently a lack of research investigating whether all three of these variables may vary across different forms of healthcare provision. Furthermore, Barder et al. (1994) found that GSE did not contribute to the prediction of depression in any of the care settings they investigated.

Alternatively, the present review supports the premise that there is a relationship between illness severity, or illness perception, and GSE, as leave-one-out analysis identified that studies that recruited palliative care patients had lower GSES mean scores, and significantly increased the heterogeneity in the analysis. Moreover, the study by Mystakidou et al. (2010b), which recruited patients receiving curative radiotherapy was also found to be a source of heterogeneity and was also removed following leave-one-out analysis (Figure 4-5). This suggestion is also supported by the studies which investigated the relationship between GSE and physical functioning, illness perception, or physical HRQoL, most of which found significant associations (Table 4-5).

4.4.5.4 Self-efficacy in Nursing Homes

Considerable heterogeneity was also observed within the community-based studies. Conducting subgroup analysis highlighted the substantial variation in the GSE of nursing home residents. Though the reason for this is unclear, previous research has found that within nursing homes factors such as adaption to facility, decision to enter, the quality of care, length of stay, and social engagement are associated with the GSE of their residents (Chang et al. 2013; Choi and Sok 2015; Fu et al. 2018; Susanto et al. 2019). Nevertheless, these factors were not investigated consistently across the studies and so the suggestion that they may contribute to the observed heterogeneity is speculative.

Another potential explanation for the variation in GSE across nursing home studies is that healthcare provision within nursing homes varies substantially across countries. In some locations nursing homes include rehabilitative services (often those in the United States of America) while others have no, or very limited, access to rehabilitative services (e.g. in the UK, Denmark, Italy, China, and Australia) (Ribbe et al. 1997; Ghavarskhar et al. 2018). This

meta-analysis found that older adults receiving inpatient rehabilitative care had significantly higher GSE than the overall population of older adults in receipt of care services, and significantly greater GSE than those residing in nursing homes. Consequently, it may be that individuals who receive some rehabilitative input in their nursing home have higher GSE versus those who do not. However, of the nursing home studies included in this review, only Susanto et al. (2019) mentioned that residents were receiving rehabilitative services, and their participants did not exhibit higher GSE than the other nursing home studies.

4.4.5.5 Self-efficacy in inpatient rehabilitation

The final significant source of heterogeneity was observed within the inpatient rehabilitation studies, where the study by Strupeit et al. (2013) was found to be significantly heterogeneous.

Of the four studies conducted in an inpatient rehabilitation facility, two recruited stroke patients or those with a functional mobility impairment (Strupeit et al. 2013; Volz et al. 2018), while two recruited individuals who had undergone hip surgery (Iannello et al. 2018; Neuman et al. 2019). Furthermore, one recruited patients as they were approaching discharge (Volz et al. 2019) whereas the other three recruited patients shortly after admission (Strupeit et al. 2013; Iannello et al. 2018; Neuman et al. 2019). Finally, while Iannello et al. (2018) and Neuman et al. (2019) recruited individuals who had been residing at home prior to admission, Strupeit et al. (2013) also recruited participants who resided in a nursing home. Volz et al. (2018) did not report where their participants resided.

Given these differences in the studies, it is suggested that the observed heterogeneity could also be explained by the health status or illness perception of Strupeit et al.'s (2013) participants or their place of residence, as patients who are at the beginning of their admission are likely to be more functionally impaired (Hellstrom et al. 2013) or perceive their health more poorly than those who are ready for discharge (Jakobsson et al. 2018). Additionally, based on the symptomology of a stroke and its impact on day-to-day life, those who have had a stroke may be more likely to perceive that their health is poor, compared to those who have had hip surgery (Schoormans et al. 2013; Mavaddat et al. 2018).

Additionally, this study found that nursing home residents had lower GSE than community-dwelling individuals receiving care from PCPs. It may be then, that in comparison to the other studies, Strupeit et al.'s (2013) participants had lower GSE prior to receiving inpatient rehabilitation.

4.5 Resilience and self-efficacy

An individual with higher self-efficacy demonstrates greater confidence in their ability to persevere through adversities. This is due to them having broader (generality) and more robust beliefs (strength) in their ability to bring about a specific, more difficult goal (level). Individuals with greater self-efficacy see adversity as a challenge, create meaning from it, and continue to push towards the desired goal (Martin et al. 2015a). Through accomplishing desired goals in the face of adversity, self-efficacy is strengthened and provides a reference for positive action in the face of future adversities (Maddux 2000; Hardy et al. 2004; Hayman et al. 2017).

This belief in the face of challenges enables the individual to be more resilient during life's adversities (Bandura 1994) and it is for this reason that self-efficacy is often conceptualised as a key component of resilience. Correspondingly, one study included in the review also found a significant relationship between older adults' GSE and their level of resilience (Stadtlander et al. 2015). Furthermore, neither self-efficacy nor resilience are static traits; rather, both are dynamic attributes that change through life and are contextual, that is they are shaped by and can shape particular situations (Guccione 2014). However, there is an important distinction between resilience and self-efficacy. Resilience is defined as the process by which individuals effectively adapt to and manage an adverse event, and is defined in relation to the adversity that the individual has to overcome, hence, you cannot measure resilience unless the stressor is also present (Schwarzer and Warner 2013). Self-efficacy, on the other hand, can have a positive impact on motivational processes even if specific stressors are absent. Therefore, while resilience can only be observed and measured in the face of adversity, self-efficacy is equally assessable regardless of whether a stressor has happened, is yet to happen, or will happen at all (Schwarzer and Warner 2013).

Recognising the relationship between resilience and self-efficacy, recent research has looked to determine whether individuals' resilience can be predicted by their GSE. Across many populations, including young offenders (McBride and Ireland 2016), orphans (Yendork and Somhlaba 2015), and adolescents (Sagone and De Caroli 2013) GSE has been found to strongly and positively correlate with resilience. Additionally, a meta-analysis which aimed to integrate data regarding the relationship between risk and protective variables and resilience found GSE to be the variable most strongly positively correlated with resilience (Lee et al. 2013).

In their master's thesis, McClain et al. (2018) looked at whether physical health, social support, and GSE are all of equal importance in predicting resilience in community-residing older adults. Of the three variables, only GSE directly predicted resilience, while social support and physical health were found to predict GSE. It was concluded that resilience in older adults can be promoted not only through GSE, but also with social support and physical health through GSE (McClain et al. 2018).

This recognition that a high level of GSE results in higher resilience has led to literature increasingly suggesting that interventions focused on improving GSE would also enable the improvement of individuals' resilience levels and other health outcomes (Lee et al. 2013; Kulakci and Emirolu 2013).

4.6 Critical Analysis

This systematic review and meta-analysis synthesised quantitative literature that measured the GSE of older adults across care settings. The primary finding of the meta-analysis was that older adults receiving acute inpatient care are at greater risk of having low GSE, and therefore of adverse health outcomes following hospital discharge. Critical analysis of the included articles, and of the overall review, allowed for the identification of some of the limitations of the analysis, and of its implications. These are discussed below.

4.6.1 Limitations

This study is the first systematic review and meta-analysis to investigate the differences in GSE between older adults receiving care in different healthcare settings. However, there are some limitations.

Firstly, GSE measures are used intermittently in research with a range of study designs in various settings and with various population groups. As a result, analysis stratified by demographic or detailed clinical variables of participants was not pre-specified, and observational study designs of reduced rigor were included. This limitation is highlighted in the substantial methodological heterogeneity between included studies; for this reason, no tests for heterogeneity were conducted between subgroups. Despite this, this review attempted to address the observed heterogeneity using a random effects model, while

subgroup and leave-one-out analysis was carried out to assess the robustness of the conclusions and to identify causes of heterogeneity (Higgins 2008).

Secondly, imputation of data can decrease the confidence that can be placed in the results of a meta-analysis. However, only one study (Carlstedt et al. 2015) included in this review required the imputation of data. Furthermore, it was for the 95% confidence interval of the participants' mean age and not data related to the GSES score. It is also deemed unlikely that the true lower 95% confidence interval of the participants' ages would have excluded this study from the review as the participants' mean age was 68.1 (range: 58-86).

Lastly, language bias may also be considered as only studies that were published in the English language were eligible for inclusion in this review, and though the studies were conducted across a wide range of geographical locations they comprised largely of European populations.

4.6.2 Meta-analysis: Critical Evaluation

Though meta-analyses are widely published and are seen as providing the 'best evidence' through synthesising the body of knowledge on a specific topic (Impellizzeri and Bizzini 2012), there can be several criticisms of meta-analyses. These criticisms primarily relate to the methods of a meta-analysis, and the quality and comparability of the studies included (Borenstein et al. 2009).

A frequent criticism of meta-analyses is that researchers focus on a summary effect and ignore that the treatment effect may vary from study to study (Bailar 1997). However, the goal of a meta-analysis should be to synthesise the effect sizes and evaluate whether the study effects are consistent or dispersed (Borenstein et al. 2009). Forest plots are frequently used to visualise this and to evaluate heterogeneity (Cochrane UK 2020). In this meta-analysis descriptive data reporting the mean GSES score of participants was synthesised across studies. While this is not a typical method of meta-analysis it has been used in previously published meta-analyses (e.g. Dharnidharka et al. 2002; Bohannon and Andrews 2011); and in the absence of studies reporting mean differences between care settings, was best suited to answering the research question at hand. Furthermore, in line with guidance, forest plots were used to identify sources of heterogeneity.

Bailar (1997) also suggests that mistakes are common in meta-analyses, and that conducting one is so complicated that they are generally performed poorly. To protect against this a detailed protocol was developed and published on PROSPERO, the findings of the meta-analysis were regularly discussed with the researcher's supervisory team, and all data extraction and quality assessment was performed by a second member of the review team. The result was a robust systematic review and meta-analysis that was accepted for publication by a specialist gerontology journal (Appendix 2).

Regarding the quality of the studies included, the phrase 'garbage in, garbage out' is often used to describe a meta-analysis that includes many low-quality studies (Borenstein et al. 2009). If a meta-analysis includes multiple biased studies that are all biased in the same direction, then the result will be a biased meta-analysis with higher precision (Borenstein et al. 2009). To avoid basing a meta-analysis on low quality research a systematic review should assess the quality of the included study and should have pre-set inclusion criteria based on the quality of a study. In this systematic review and meta-analysis included studies were assessed using quality assessment tools specific to their study design (Table 4-1). Though these identified some potential areas at risk of bias in individual studies none were found to be of low quality overall (Table 4-2) and, as such, none were removed from the meta-analysis.

Nevertheless, there is still the risk of publication bias due to the eligibility criteria which stated that eligible studies had to be published in peer-reviewed journals, as studies finding significant treatment effects are more likely to be published than studies which do not (Borenstein et al. 2009). However, publication bias is a risk associated with any kind of literature search, as such priority is given to ensuring that the systematic search of data is replicable and based on a robust search strategy. While the search strategy for this meta-analysis was broad (Section 4.4.2) it was developed based on the findings of a preliminary search which found that a more specific search strategy resulted in eligible studies being missed, and was therefore created to ensure that there was as little publication bias as possible. This also mitigates against another critique regarding the methods of meta-analysis: that important studies can be missed; explicit eligibility criteria and a robust search strategy should prevent this (Borenstein et al. 2009).

Another phrase commonly used to describe a low-quality meta-analysis is that it 'mixed apples and oranges'. This is used to describe a meta-analysis that combined the data from very different studies. Borenstein et al. (2009) are clear that the studies brought together in

a meta-analysis will inevitably differ, however decisions need to be made about how similar they need to be. In this systematic review and meta-analysis there were significant differences in the purposes and methods of each study and in the characteristics of each study's participants. However, the strength of a meta-analysis is that it enables researchers to empirically investigate the differences between each 'fruit' (Borenstein et al. 2009). For instance, in this meta-analysis inclusion of a variety of studies enabled the researcher to identify that palliative care studies demonstrated significantly different results compared to other studies.

Given the discussion above, it is the researcher's belief that while there are limitations in the presented meta-analysis, the systematic review and meta-analysis was carried out following a method that emulates the desired characteristics of being objective, systematic, transparent, and replicable (Singh 2017). Furthermore, the results of the systematic review and meta-analysis were critically appraised by a peer-review process, which led to the publication of an article in an international, interdisciplinary, open-access journal (The Gerontologist, Impact Factor = 3.286) (Whitehall et al. 2020, Appendix 2).

4.6.3 Clinical and Research Implications

General self-efficacy is an operative construct; that is, it is related to subsequent behaviour and, therefore, is relevant for clinical practice and behaviour change (Schwarzer 1992). Considering the continued growth of the older population and given that GSE has been found to be predictive of positive health behaviours, it is of importance that GSE is considered and addressed in the care of older adults.

This systematic review and meta-analysis found that individuals receiving acute inpatient care are at risk of having lower GSE, in comparison with those in inpatient rehabilitation settings, attending outpatient clinics, or receiving care from PCPs. Additionally, the study by Iannello et al. (2018) suggests that older adults' GSE may decline during inpatient admission. These findings should, however, be interpreted with caution as the difference in the findings of Volz et al. (2018) and Strupeit et al. (2013) suggests that GSE may then increase again as individuals approach discharge. This finding is not dissimilar to the results of Tousignant et al. (2012) who found that while the GSE of their control group increased, after receiving standard day-hospital physiotherapy, a larger and longer-lasting improvement in GSE was seen in their experimental group, who received tailored tai-chi interventions instead. It is

proposed, therefore, that even if GSE routinely increases closer to inpatient discharge, there is the potential for this to be enhanced.

Previous research has shown that interventions can be successful in improving the GSE of older adults (Jones et al. 2009; Tousignant et al. 2012). However, it is proposed that these interventions should be based on everyday activities of older adults, or something that can be easily built into everyday life, as literature suggests that older adults need more tangible everyday experiences to bring about changes in subjective well-being (Enkvist et al. 2012). Furthermore, they need to involve the active participation of the older adult, as a study that investigated the efficacy of increased nurse-led consultations following stroke rehabilitation found no significant differences in the final GSES scores of their intervention and control group (Strupeit et al. 2013). Consequently, it is recommended that GSE interventions should focus on providing mastery experiences, enabling patients to successfully complete tasks, so that they feel more confident in attempting new behaviours (Köhler et al. 2018). Considering that this review found that individuals receiving acute inpatient care are at risk of having lower GSE it is recommended that future research should focus on the implementation and effectiveness of GSE interventions in inpatient care settings.

Concerning older adults residing in nursing homes, the findings of this review suggest that they have the potential to have some of the highest and lowest levels of GSE among older adult populations. Nursing home managers should consider how they could foster their residents' GSE as low GSE in nursing home residents has been found to be significantly related to both shorter life expectancy and greater death anxiety (Shokri and Akbari 2016). The previous discussion (Section 4.4.5) has touched upon factors that have been found to influence the GSE of older adults residing in nursing homes; those that are modifiable should be considered as ways to improve residents' GSE.

Considering the results of this review, it is recommended that future research should focus on:

Firstly, the implementation and effectiveness of GSE interventions in inpatient care settings. Low GSE is understood to be a predictor of both negative health outcomes and poorer protective personality characteristics, such as resilience (Stadtlander et al. 2015; Liu et al. 2018). As such, healthcare recommendations suggest that development of GSE-focused interventions will aid complex decision-making in the healthcare of older adults and will improve their health outcomes (Hardy et al. 2004; Lee et al. 2013; Hicks and Conner 2014;

Kulakçi and Emirolu 2013). In view of this, further research is needed that investigates the relationships between GSE and other protective personality characteristics in older adults receiving inpatient care, and assesses the impact of GSE interventions on their subsequent, post-discharge, health outcomes.

Finally, given that palliative care studies were found to be a large source of heterogeneity in this review, further research is needed to investigate whether the setting in which palliative care is given impacts upon the GSE of those receiving the care, and whether the setting could be altered to improve the quality of life of older adults approaching the end of their life.

4.6.4 Implications of the systematic review and meta-analysis to the present research

Resilience is understood to be both contextual and situational, as it is the result of an interaction between an individual, their environment, and an adversity (Johnson and Wiechelt 2004; Vanderbilt-Adriance and Shaw 2008). Accordingly, it is suggested that the resilience of older adults may vary between those who receive healthcare services and those who do not, as well as across healthcare settings (Rodin 1986). If this is correct, then current resilience research, which has primarily recruited community-dwelling older adults, is limited in its applicability to older adults receiving health care services (Hardy et al. 2004; Windle et al. 2010).

Unfortunately, at present there are very few studies which have investigated the resilience of older adults receiving health care services. This makes it difficult to determine whether the resilience of older adults is affected by receipt of health care services, and whether their resilience varies based on the setting in which care is received.

Self-efficacy is conceptualised as a key component of resilience, and GSE has been found to be predictive of resilience in multiple studies conducted across various populations, including in populations of older adults (McClain et al. 2018). Furthermore, the lack of a self-efficacy dimension is noted as a significant limitation of some resilience measures (Campbell-Sills and Stein 2007).

Drawing on this understanding, this systematic review and meta-analysis was undertaken to primarily assess the GSE of older adults across healthcare settings, as it was theorised that

any patterns observed in the GSE of older adults may also be present in the resilience of older adults.

The results of the systematic review and meta-analysis suggest that the GSE of older adults receiving care is significantly lower than the GSE of older adults who do not receive healthcare services, thus supporting the understanding that self-efficacy is contextual (Pajares 1991). Furthermore, the results suggest that the GSE of older adults receiving care varies based on the environment in which care is received; with those receiving acute inpatient medical care being at the greatest risk of having low GSE.

Consequently, it is proposed that the results of this systematic review and meta-analysis support the theory that the resilience of older adults will differ between older adults receiving care and those who are not, and will also vary in relation to the setting in which care is received. Moreover, it is suggested that the results of this meta-analysis suggest that older adults receiving acute inpatient medical care are at risk of having the lowest resilience.

In view of this, it is concerning that, though the literature about resilience is steadily growing, there is a lack of research which has investigated the resilience of older adults receiving acute hospital care. This dearth of hospital-based geriatric resilience research is particularly troubling given that resilience is understood to influence older adults' quality of life and physical and mental well-being (Rossi et al. 2007; Lu et al. 2017; Scelzo et al. 2018), each of which is understood to be negatively affected by inpatient hospital admission (Meira et al. 2015; Karampampa et al. 2016).

It is proposed, therefore, that the results of this systematic review and meta-analysis not only support the understanding that resilience is contextual, that it may vary between community-dwelling older adults and older adults receiving care, and that older adults receiving inpatient acute hospital care may be at the greatest risk of having low resilience; but also supports the call for further resilience research to be conducted with different populations of older adults, particularly during hospitalisation or when ill health is a serious threat (Hardy et al. 2004; Windle et al. 2010; Ezeamama et al. 2016; Fullen and Gorby 2016).

4.7 Conclusion

Self-efficacy refers to the belief that one has in their own ability to bring about a specific goal in a particular situation (Resnick 2014). In the face of adversity self-efficacy reflects the motivation and belief to adapt and cope with the stressful life events (Schwarzer 1992). Consequently, self-efficacy is considered an important resilience resource.

In later life the self-efficacy of older adults is subject to reappraisal, and often changes in accordance with ageing, disability, and illness (Bandura 1994). This reappraisal can lead to a reduction in the self-efficacy of older adults, which can result in reduced involvement in ADL, unsuccessful attempts at making health modifications, and failing to adhere to treatment (Easom 2003). Consequently, it is of importance that self-efficacy is considered by healthcare services that aim to promote well-being and independence in older adults particularly as lower self-efficacy is associated with increased healthcare use by older adults (Scherer and Bruce 2001; Bock et al. 2018).

This recognition has led to an increase in the number of studies which have assessed the GSE of older adults receiving care, in order to develop GSE interventions that will improve the quality of life of older adults and to identify where they should be targeted. However, very little research has investigated whether there is any effect of the healthcare setting on the GSE of older adults.

The primary focus of this chapter was a systematic review and meta-analysis which sought to determine whether older adults who receive healthcare services have lower GSE than those who do not, and to investigate whether older adults receiving healthcare services are at risk of having lower GSE based on the environment in which care is received.

This meta-analysis synthesised the quantitative data published by studies which presented the GSE scores of older adults receiving various forms of healthcare provision. The quality of included studies was assessed using assessment tools specific to their study designs. It is considered that the primary limitation of the meta-analysis is that it used an unorthodox method of producing cumulative means, as a consequence of descriptive data being presented for only one participant group in the majority of studies. Empirical studies that assess the difference in GSE across care settings with demographically similar populations would be beneficial in determining whether the results of this meta-analysis are valid.

The reviewed evidence showed that the GSE of older adults receiving care is significantly lower than the GSE of older adults who do not receive healthcare services, and that older adults receiving acute inpatient medical care are at the greatest risk of having low GSE. Based on the findings of the included studies, it appears that this may be an implication of a reduced sense of control, increased anxiety and stress, changes in social dynamics, and poor health perception.

Given that self-efficacy is a key component of resilience, and is predictive of resilience in older adults (McClain et al. 2018), the results of the systematic review and meta-analysis suggest that the resilience of older adults may also vary between individuals receiving care and community-dwelling older adults, and that individuals receiving acute inpatient hospital care are at risk of having low resilience. However, while GSE has been investigated with populations of older adults receiving clinical care, there is a dearth of geriatric resilience research conducted with populations of older adults experiencing ill health or receiving inpatient care (Hardy et al. 2004; Windle et al. 2010). In view of this, the following chapter presents the methods used to carry out research investigating the resilience needs, protective factors, and vulnerability factors of older adults receiving care in a MoE ward, before results are presented in chapter six, and discussed in chapter seven.

Chapter 5 Methodology and Methods

5.1 Introduction

Recent developments in geriatric research have brought about a shift in focus from pathology-orientated models, to the concepts of healthy ageing and resilience (Wild et al. 2013). Both models of healthy ageing and resilience seek to identify factors that support the health and well-being of older adults (Fullen and Gorby 2016; Hornby-Turner et al. 2017). However, there is some concern that the clinical application of models of healthy ageing is still placing focus upon older adults' individual characteristics and intrinsic capabilities, rather than the effect of their environment (Fernández-Ballesteros et al. 2017; Belloni and Cesari 2019). Resilience, defined as an individual's ability to adapt to and manage an adverse event, is understood to be influenced by both individual and environmental factors (Johnson and Wiechelt 2004; Wild et al. 2013). Consequently, it is proposed that a comprehensive assessment of the process of resilience may provide a greater opportunity to understand the influence of environmental factors on older adults' quality of life, life satisfaction, and their ability to adapt well in the face of adversity (Wild et al. 2013).

Current conceptualisations of resilience have focused on the identification of protective and vulnerability factors that promote or reduce resilience following stressful events. These efforts have been translated into the realm of health promotion, which assumes that individuals with less resilient qualities can be recognised, and that appropriately designed interventions can enhance their protective mechanisms (Esche and Tanner 2005; Clark et al. 2011).

Still, monitoring resilience is relatively new to healthcare (Martin 2016) and little research has focused on its impact in older adults when ill health is a serious threat (Windle et al. 2010). Understanding resilience may be helpful in supporting older people to transition well from hospital to home, to stay within their communities for longer, to experience pro-active maintenance of their well-being, and to prevent further hospitalisation (Hardy et al. 2004; Esche and Tanner 2005; Muenchberger and Kendall 2010). Specifically, investigating the resilience of older adults at critical health-state transitions, such as during an acute hospital admission or at discharge, has been identified as having the potential to inform development of effective, resilience-focused interventions (Martin 2016).

This study utilises a cross-sectional design to assess the validity of the MiC questionnaire, and to identify the 'resilience needs' of older adults receiving acute hospital care, as well as the protective factors and vulnerability factors associated with their resilience. Data were collected over a period of 13 months from 421 older adults receiving acute care in the Medicine of the Elderly wards at the Royal Infirmary of Edinburgh (RIE). Data from the participants were collected using a battery of paper and pencil self-report and MDT-completed questionnaires.

This chapter firstly reiterates aims of this study (Section 5.2), this is followed by an overview of the study's methodological and conceptual basis (Section 5.3). Section 5.4 outlines the programme of the work undertaken and includes information about the participants of the study, the measures used, and the rationale for their use. Finally, Section 5.5 offers an explanation and rationale for the analyses conducted in this study.

5.2 Research aims

The aims for the current study are:

- To determine whether the MiC questionnaire is a valid measure of older adults' resilience during hospital admission.
- To investigate the specific 'resilience needs' of older adults receiving acute inpatient care and establish how they are related to functional ability, health status, and care packages.
- To identify the protective and vulnerability factors associated with the resilience of older adults receiving acute hospital care, and how their association varies across the resilience distribution.
- To determine whether there is a relationship between participants' self-rated resilience and frailty, and to investigate whether their self-efficacy has a mediating effect on the relationship.

5.3 Methodological basis

Theoretical paradigms are the starting point of research. They provide the assumptions from which research is based; thus influencing how the study is conducted, the researcher's role in it, and the knowledge that is produced (Crotty 1998). Every theoretical paradigm takes an ontological and epistemological stance, which informs the subsequent research methodology and methods (Crotty 1998).

The post-positivist paradigm, or post-positivism, states that reality is objective and external from individuals, however it cannot be fully known or measured by humans as this objective reality can be viewed in multiple ways, and is subject to the subjective bias of the researcher which cannot be completely removed from research (Cohen et al. 2017). Accordingly, observations are said to be 'theory-laden'. Furthermore, post-positivism asserts that knowledge is not certain, but is incomplete, hypothetical, falsifiable, challengeable, and changing (Cohen et al. 2017). As a result, knowledge consists only of previously tested hypotheses that have thus far not been proved incorrect (Illing 2014). Post-positivism therefore values triangulation of research in determining objectivity (Illing 2014).

This research is based in the post-positivist paradigm. The ontological stance of the researcher is that there is an objective reality, and their epistemological position is that the scientific method provides us with the best means of understanding this objective reality. Accordingly, it is the researcher's view that there is benefit in seeking to explain what happens in the social world through measurement of patterns and relationships. However, the epistemological position of the researcher also recognises that, while objective truth is desirable, this research will provide only an approximation of the truth as the theories generated will be open to further investigation and revision.

Grounded in post-positivism, this research uses a quantitative methodology to develop theories that can explain the observed phenomena as accurately as possible. Consequently, the research depends upon a measurement tool, the MiC questionnaire (QMU and NHS Lothian 2015). Guided by an objectivist epistemology the researcher assumes that subjective internal states, like self-efficacy and resilience, can be operationalised through translating them into numerical data. This data can then be worked, combined, and presented while retaining its objective relationship with the internal states from which they originated (Rolfe 2013). However, the observations and conclusions made are theory-laden, and as such,

findings presented will reflect probabilities in the relationships between independent variables and resilience (Illing 2014).

5.4 Programme of work

The following sections outline the programme of work that was completed in order to investigate the resilience of older adults receiving inpatient care in an acute MoE ward, using the MiC questionnaire. Sections 5.4.1 to 5.4.6 describe the processes involved in recruiting participants and collecting data. Sections 5.5.1 to 5.5.7 summarise the methods used to analyse the data collected from the participants.

5.4.1 Dataset

According to Cheng and Phillips (2014) there is confusion between the terms 'primary data', 'primary data analysis', 'secondary data', and 'secondary data analysis'. They conclude that 'primary data analysis' refers exclusively to the analysis of data collected by members of a research team who aim to answer the original study hypothesis, while all other analysis of data is considered 'secondary analyses of existing data' (Cheng and Phillips 2014). Secondary analysis of existing data can provide access to large sample sizes and relevant measures, enabling generalisable answers to high-impact questions. Furthermore, this approach to research has become an increasingly popular method of conducting health research (Cheng and Phillips 2014), particularly as it enables vulnerable populations to be studied in greater depth, without risking their well-being (Vartanian 2010).

This current research used data collected between 20th August 2018 to 27th September 2019 from older adults admitted to three MoE wards, and who would be discharged to their previous place of residence. The 'original study' is a prospective cohort study across three MoE wards at the RIE, which will investigate the relationship between resilience and hospital readmission. Therefore, the focus, and hence analysis, of this study is secondary to that of the original study.

Secondary analysis of existing data should begin with the definition of a research topic or question, before selecting a dataset that will enable these questions to be investigated (Smith et al. 2011). Having determined research questions and a plan for statistical analysis, the

researcher identified that the original dataset is the sole dataset to contain data regarding the resilience, self-efficacy, frailty status, and demographics of older individuals receiving inpatient care in a MoE ward. Furthermore, the use of MiC questionnaire enables the researcher to consider environmental factors which are thought to influence the participants' resilience.

In addition to the benefits of secondary analysis of existing data, the data included in this study was collected, coded, and cleaned by the researcher undertaking this analysis. As such, while this study is classed as secondary analysis of existing data it is also an example of primary data collection. As a result, the researcher still has the close familiarity with study subjects and data collection nuances, such as reasons for missing data, that is invaluable in assessing the validity and generalisability of their results and is often lost in the secondary analysis of existing data (Smith et al. 2011; Cheng and Phillips 2014).

Nevertheless, inherent to the nature of secondary analysis of existing data, the data used in this study was not collected to address the current research question and the measures used were predetermined. Despite this, it is argued that the measures used were preferable over other measures of the same constructs, this can be found in Section 5.4.4.

5.4.2 Sample size

The sample size was determined by the recruitment procedure of the original study (Vartanian 2010). During the first four weeks of data collection 37 eligible patients were discharged from the three MoE wards at the RIE; of these 29 were recruited for the study. Based on these discharge and recruitment figures, and given that data collection was planned to take place over 58 weeks, it was estimated that data from approximately 400 participants would be included in this study.

Given these projected numbers and the proposed multivariable ordinary least squares (OLS) analyses, G*Power sample size software (Faul et al. 2009) suggested that the analysis would be able to detect a small effect (0.05) (Cohen 1988, p. 412), at a power of 0.8 and significance level of 5% with 12 independent variables.

Figure 5-1 shows, as an example, the number of independent variables that can be included in a multivariable OLS regression model in order to detect a small (0.05) and medium (0.15)

effect size with a range of sample sizes, based on a power of 0.8 and a significance level of 5%.

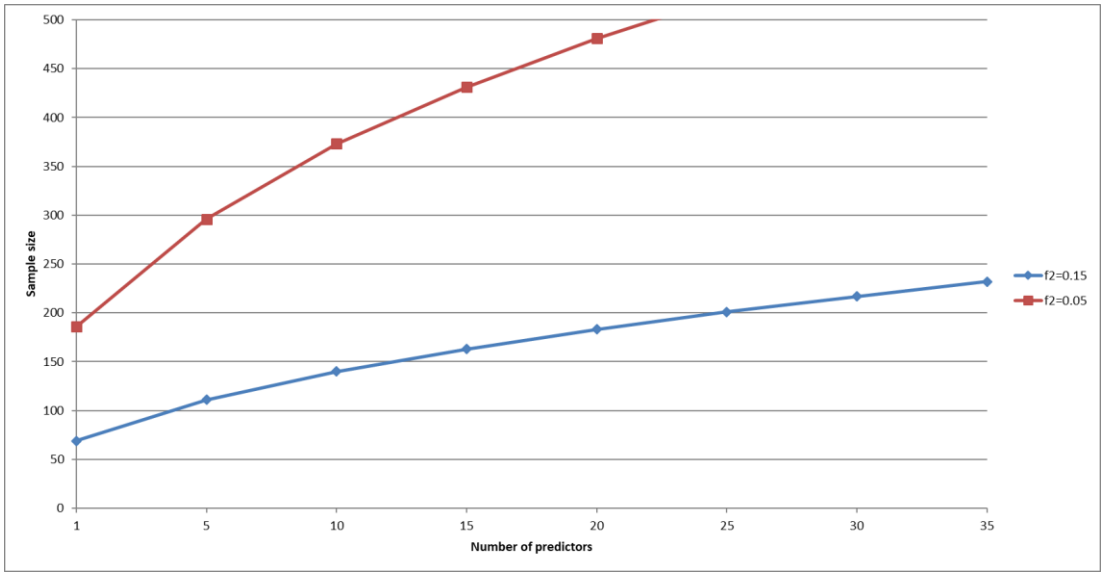

Figure 5-1: Multivariable OLS regression effect size graph

It was deemed that this sample size was also satisfactory for the exploratory factor analysis (EFA), which was conducted to assess the validity of the MiC questionnaire. It is advised that EFA should use data from at least 300 participants, or should allow for five to ten observations per variable (Comrey and Lee 1992; Yong and Pearce 2013). Given the largest subscale of the MiC questionnaire contains 21 items, a sample size of around 400 participants would meet these requirements.

Over 58 weeks, 1,641 patients were discharged from the three MoE wards. Of these 584 were eligible to participate in this study. Of these, 59 declined to participate, 17 were not accessible due to infection control, 36 were discharged out-of-hours, and 48 were discharged before they could be seen. In total, 421 participants were recruited for the original study, 418 participants' data were used in this study. Recruitment rate remained consistent through the data collection period as illustrated in Appendix 3.

5.4.3 Ethical considerations

5.4.3.1 Informed consent

Patients eligible to take part in the original study had to be able to provide informed consent. Informed consent requires participants to fully understand what it means for them to take part in the research, and to give consent before they participate (University of Oxford 2019).

A process approach to capacity assessment was adopted for the original study; this meant that a patient's capacity to consent was determined based on the judgement of medical staff at the time the patient was ready for recruitment (Dewing 2007; 2008). This approach to capacity assessment within acute medical wards has been found to considerably increase the proportion of patients eligible to participate in a study (Adamis et al. 2010).

If the medical team member felt the patient had the capacity to provide informed consent it was then sought by the researcher following the procedure described in Section 5.4.5.

It was made clear to patients that participation in the study was voluntary and they had no obligation to take part. Furthermore, it was explained that if they wished to decline to participate, or to withdraw consent during data collection, they would not have to provide a reason for this decision and their usual care would continue as normal. Crucially, for the present study, participants were also asked to consent to anonymised data being used in future studies and for educational purposes (Appendix 6).

Both verbal and written information was provided about the study, and the researcher asked the patient to recount the study information to check understanding. Once patients were enrolled in the study they were given contact details for the research team so that if they wished to withdraw consent, or required further information at a later time, they could contact a member of the original study's research team.

5.4.3.2 Emotional response

The risk of a participant experiencing emotional distress due to participation in the original study was deemed to be small as the contents of the MiC questionnaire and the Optum™ SF-12v2® were not thought to relate to sensitive areas, as defined by the No Material Ethical Issues Tool (NHS Health Research Authority 2014). Furthermore, if medical staff were concerned that participation may harm the patient's well-being, the patient was not approached by the researcher.

Nevertheless, as the MiC questionnaire includes items that relate to personal and environmental factors that impact upon an individual's perceived level of resilience, there was some risk that they may trigger memories or feelings that could result in an emotional response.

If this occurred the researcher would ask the patient whether they wanted to continue completing the questionnaires. If the patient wished to stop the researcher would offer to return at a different time. If the patient did not wish to take this option, the researcher would withdraw and liaise with a member of the clinical team to ensure the patient received appropriate support.

5.4.3.3 End-of-life care

In the final year of life individuals have an average of 3.5 admissions to hospital (NICE 2011). During this stage of life there are often growing cognitive difficulties, and participation in research has the potential to place greater risk upon this population (Field and Cassel 1997; Casarett and Karlawish 2000). However, studies have found that altruism is an important value for some individuals at the end-of-life, and that preventing them from making their own decisions about participating in studies is to deprive them of contributing to future generations (Field and Cassel 1997).

For this reason there were no eligibility criteria that stipulated that participants must not be receiving palliative care. However, as with all other patients, the responsibility deciding whether it would be appropriate for the patient to be approached by the researcher fell to the clinical staff.

5.4.3.4 Burden

If a patient provided informed consent to take part in the original study their involvement was limited to the completion of the MiC questionnaire and the Optum SF-12v2 Health Survey. The participants were all aware that they would not be followed up in the community and that their contact details would not be recorded.

5.4.3.5 Benefit

For some patients there was no direct benefit from participating in the original study. However, a recent study (Clarke et al. 2018) found that older adults receiving care in medical hospital wards often experienced feelings of passivity and boredom during an inpatient stay,

due to lack of opportunities for meaningful activity. It may be, then, that participants found some benefit in taking part in the study as a 'way to pass the time'.

5.4.3.6 Ethical approval

Having considered the ethical ramifications discussed, the original study's research team obtained ethical approval through IRAS for the collection of the original dataset. Permission to use the dataset for the present study was given by the research team, and, for the purposes of data collection, a further amendment (Appendix 4) was made to the IRAS application to add the current researcher as a researcher for the original study.

Caldicott Guardian approval was also obtained for the collection of patient-identifiable information (e.g. name and CHI number) and the subsequent transport of this data from the RIE to QMU.

The present study was exempt from QMU Research Ethics Panel approval, as NHS R&D approval has already been granted through IRAS (IRAS project ID: 189746) (Appendix 5).

5.4.3.7 Confidentiality

Storage of participant data was congruent with the Data Protection Act (HM Government 1998), the Queen Margaret University (2015) research data management policy, and the approval granted by Caldicott Guardian. Accordingly, participant data were stored on encrypted laptops and computer servers which research staff had sole access to.

5.4.4 Measures

5.4.4.1 Introduction

The use of measurement within healthcare research and practice is commonplace; it is used to diagnose illness, contrast health differences between populations, indicate priorities for health promotion, and monitor the effectiveness of healthcare provision (McDowell 2006).

Broadly, the distinction between subjective and objective measures depends on whether a person (e.g. clinician, patient) makes a judgement that forms the indicator of health. Ratings that require judgement are generally considered subjective measurements (McDowell 2006).

Subjective measurements extend the information available by describing not only the quantity of function but also its quality. Depending on their design they may also offer a way

to hear 'the small, frantic voice of the patient' (Elinson 1978, cited in McDowell 2006, p. 12). As a result, health indicators which were previously thought to be too complex to measure are becoming the focus of assessment (Streiner et al. 2015). However, the use of reliable tools which truly measure the latent variable of interest is crucial.

This section outlines the measures used in the present study, and the rationale for their use.

5.4.4.2 Making it CLEAR questionnaire

A recent review of resilience scales identified 15 measures of resilience; amongst these no 'gold standard' resilience measure was found (Windle et al. 2011). While the CD-RISC (Connor and Davidson 2003), the Resilience Scale for Adults (Friborg et al. 2005), and the BRS (Smith et al. 2008) received the best reported psychometric ratings (i.e. construct validity, content validity, internal consistency, test-retest, and interpretability), some details were missing (i.e. criterion validity, responsiveness, floor/ceiling effect) and many overlooked the impact of environmental factors on a person's resilience. This lack of attention on family and community resources was highlighted as a major flaw of previous attempts to create a valid resilience measure (Windle et al. 2011). This weakness is particularly problematic when assessing the resilience of older adults as research has shown that the influence of situational and social factors on resilience is likely to be increased in advanced age (Hayman et al. 2017).

In response to the identified need for multidimensional resilience measures (Windle et al. 2011), the MiC questionnaire was developed to accurately assess older adults perceptions of their resilience based on examination of a range of factors occurring at the individual and environmental levels (QMU and NHS Lothian 2015).

The first iteration of the MiC questionnaire consisted of 46 items each pertaining to a factor associated with the resilience of older adults, these were identified in through an integrative literature review (QMU and NHS Lothian 2015). This 46-item MiC questionnaire was then piloted with 198 community dwelling older adults. Psychometric analysis confirmed that the questionnaire had satisfactory construct validity, internal consistency, concurrent validity, and test-retest reliability (QMU and NHS Lothian 2015). However, 24 items were found to be redundant, that is they did not contribute to accurate measurement, and a large quantity of items were found to be 'too easy', that is they tended to generate agreement (QMU and NHS Lothian 2015). In response to this analysis, the 24 redundant items were removed and ten

more difficult items were added, the wording of some of the retained items were also amended (QMU and NHS Lothian 2015).

The resulting MiC questionnaire consists of 34 items, split across two subscales, which assess both the individual and environmental determinants of older adults' resilience (QMU and NHS Lothian 2015). The IDoR subscale of the MiC questionnaire consists of 21 items that correspond to participants' habituation, volition, and performance skills (motor skills, social interaction skills, and process skills). The EDoR subscale consists of 13 items which correspond to the physical and social environment. Over the 34 items, question subsets relate specifically to self-care, leisure, work, responsibilities, physical environment, social environment, resources, habits, values, self-efficacy, motor skills, communication skills, and process skills. Each item of the MiC questionnaire is rated on the same four-point Likert-type scale, indicating how strongly the patient either agrees or disagrees with the statement (Appendix 1).

As discussed in Section 3.5.1, the MiC questionnaire is not the sole resilience measure to include environmental factors associated with resilience. Both the MIIRM and the MiC questionnaires provide more multidimensional assessments of older adults' resilience through the inclusion of environmental factors (Martin et al. 2015a; QMU and NHS Lothian 2015). However, the MiC questionnaire was deemed to offer a more robust evaluation of older adults' resilience, as it includes questions relating to the individual's perceived health and physical environment (QMU and NHS Lothian 2015), which are not addressed by the MIIRM (Martin et al. 2015a). Despite this, it was still noted that one limitation of the MiC questionnaire was that it was developed in the community, and therefore its validity in clinical care settings is not determined.

In recognition of this, the MiC research team identified the need for a formal study to analyse the MiC questionnaire's predictive validity and reliability to support its use in clinical practice, and a pilot site for its use in acute hospital care settings was identified at the RIE.

5.4.4.3 The Optum™ SF-12v2® Health Survey

The Optum™ SF-12v2® Health Survey (Appendix 7) is a patient-reported multidimensional measure of functional health and well-being (Ware et al. 2009). It consists of 12 items, spanning eight health domains: Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional, and Mental Health, and provides psychometrically-based physical component summary (PCS) and mental component

summary (MCS) scores. The Optum SF-12v2 Health Survey was selected for use in this study as it is a quick, reliable, and valid measure of physical and mental health that is particularly useful in large samples.

There are other tools designed to assess an individual's health status. These include the Nottingham Health Profile (Hunt et al. 1981), European Quality of Life (Euro-QoL): EQ-5D-3L™ (EuroQol Research Foundation 1990), the Euro-QoL: EQ-5D-5L™ (EuroQol Research Foundation 2009), and the Optum™ SF-36® (Ware and Sherbourne 1992). However, these were deemed less appropriate for various reasons:

The Nottingham Health Profile was not intended for use with hospitalised patients (McEwen and McKenna 1996), whereas the Optum SF-12v2 Health Survey has been applied successfully in research conducted in acute care settings (Gardner et al. 2009).

The EuroQoL: EQ-5D-3L™ assesses five dimensions of health across three levels ('no problems', 'some problems', and 'extreme problems') and expresses health status in a single index score (EuroQol Research Foundation 1990). However, due to the small number of levels per dimension, it has been found to lack sensitivity to small differences in health and well-being (Johnson and Coons 1998; Johnson and Pickard 2000; Herdman et al. 2011). In comparison, the Optum SF-12v2 is more sensitive to differences associated with less severe morbidity in adult and older adult populations (Johnson and Coons 1998; De Smedt et al. 2014).

The EuroQoL: EQ-5D-5L™ was produced by the EuroQol Research Foundation in recognition of the EQ-5D-3L™'s poor discriminative capacity and sensitivity (EuroQoL Research Foundation 2017). It assesses the same five dimensions but across five levels ('no problems', 'slight problems', 'moderate problems', 'severe problems' and 'extreme problems') (Herdman et al. 2011; EuroQoL Research Foundation 2017). This has been shown to increase the sensitivity of the measure, though primarily for those reporting extreme problems (Janssen et al. 2012; EuroQoL 2017; Martí-Pastor et al. 2018). Nevertheless, despite the improved measurement properties, the EuroQoL: EQ-5D-5L™ only contains one item relating to mental health (EuroQoL 2017), while the Optum SF-12v2 produces both a physical and mental health composite summary score based on an individual's response to all 12 items (Ware et al. 2009). It was therefore anticipated that the more robust assessment of mental well-being provided by the Optum SF-12v2 would enable the researcher to more reliably assess the association between resilience and mental well-being.

Finally, the Optum™ SF-36® was designed as a generic indicator of health that could also be used with more specific measures as an outcome measure in clinical practice and research (McDowell 2006). However, it is documented that it can take up to 15 minutes to complete (McHorney 1996). The Optum SF-12v2 is an abbreviation of the Optum SF-36 and takes around five minutes to complete, thus reducing respondent burden. Additionally, the Optum SF-12v2 has been shown to largely replicate the PCS and MCS scale values obtained by the Optum SF-36; when used with large samples any loss of precision is unlikely to be significant (McDowell 2006).

In a population of older adults, the Optum SF-12v2 has also been found to have satisfactory internal consistency in both the PCS scale (Cronbach's α: 0.81) and in the MCS scale (Cronbach's α: 0.83) (Su and Wang 2019), with the SF-12v2 summary scores adequately differentiating subgroups of older adults by age, marital status, and self-reported health problems (P≤0.05) (Su and Wang 2019).

5.4.4.4 Barthel Index

The Barthel Index (BI) (Appendix 8) consists of ten items that measure an individual's level of daily functioning (Mahoney and Barthel 1965). The items relate to feeding, transferring from a bed to a wheelchair and to and from a toilet, grooming, walking on a level surface, going up and down stairs, dressing, and continence of bowel and bladder. The BI can be used to determine a baseline level of functioning and can be used to monitor improvements in ADL over time. A modified version of the BI has been introduced, which gives a maximum score of 20 with scores ranging from zero to three for each activity (Collin et al. 1988). The BI has demonstrated high inter-rater reliability (κ= 0.95) and test-retest reliability (*r*= 0.89) as well as high correlations (*r*= 0.74-0.8) with other measures of physical disability (O'Sullivan and Schmitz 2007).

Crucially, the BI has been recommended by the Royal College of Physicians (1992) for routine use in the assessment of older people, as it was deemed to reflect their existing informal activities, and has been previously used in research conducted in busy acute care settings (Shearer and Guthrie 2013; Stein et al. 2015). Additionally, unlike the Katz Index of Independence in Activities of Daily Living (Katz et al. 1963) and The Health Assessment Questionnaire Disability Index (Fries et al. 1980) the BI can be completed using data obtained from medical records and does not require training to complete (Katz 2003).

5.4.4.5 Clinical Frailty Scale

The gold standard for the management of frailty in older people is the process of care known as Comprehensive Geriatric Assessment. However, as CGA is time-consuming, a range of assessment tools to screen for frailty has been produced to allow for the quick identification of individuals who require CGA.

The Clinical Frailty Scale (Appendix 9) is one example of a screening tool that was developed to be both predictive of frailty and easy to use (Rockwood et al. 2005). The CFS is a nine-point scale which encompasses a broad assessment of frailty based on the clinical health and performance abilities of the older adult (Rockwood et al. 2005).

In acute care settings, the CFS has several advantages over other scales (Gilardi et al. 2018); it is quick to complete (unlike the Frailty Index (Mitnitski et al. 2001)) and it does not require extra staff, the measurement of specific items or use of specialised equipment (e.g. grip strength is measured in the Frailty Phenotype (Fried et al. 2001) and the SHARE Frailty Instrument (Romero-Ortuno et al. 2010), while the EFS includes a Timed Up-and-Go Test (Rolfson et al. 2006)).

Furthermore, the CFS was found to be highly correlated (r=0.8) with the Frailty Index, and predictive of risk of mortality and entry into an institution (Rockwood et al. 2005). Finally, the CFS has also been validated and used in several studies of frailty and is beginning to be routinely used in hospital settings (Chan et al. 2010; Conroy and Dowsing 2013; Martocchia et al. 2013).

5.4.4.6 Demographic questionnaire

The original dataset also contains information regarding the demographic variables of participants, including gender, marital status, ethnicity, religion, employment status, whether the participant lives alone, and type of property, as well as the Scottish Index of Multiple Deprivation (SIMD) overall rank and quintile rank for their postcode (Appendix 10). This enabled the researcher to investigate the associations between a range of sociodemographic variables and the individual and environmental determinants of resilience.

5.4.4.7 Care package summary sheet

Comprehensive information about an individual's package of care (PoC) was obtained using the Care Package Summary Sheet (Appendix 11). This included information about any pre-

admission PoC, the availability of an unpaid carer, the availability of PoC on discharge, the care provider and their contact details, and the care timetable. In the same way that demographic variables were included in the analysis, relationships between PoC variables and individual and environmental determinants of resilience were assessed.

5.4.5 Recruitment

In order to optimise recruitment, and to gather information from a sample representative of patients receiving care in the MoE wards at the RIE, the researcher identified potential participants through the MDT boards in participating wards, the wards' morning handover meetings, and the wards' weekly MDT meetings.

Patients who the researcher believed met the inclusion criteria of the study (Table 5-1) were then discussed with a doctor or nurse responsible for the care of the patient. The responsibility of deciding whether a patient was eligible for recruitment into the study fell to the clinical staff.

Co-enrolment was acceptable in the original study. If a patient was known to be taking part in another research project the clinical staff member was responsible for deciding whether participation in multiple studies would compromise the patient's safety or risk the validity of a study. If a patient was enrolled in multiple studies this was recorded.

If a patient was deemed eligible to participate a member of the clinical staff was asked to check with the patient that they were happy to engage with the researcher. If the patient consented, the researcher was introduced to the patient, the purpose of the original study was explained, and the patient was informed of what their participation would involve.

Table 5-1: Participant inclusion and exclusion criteria for the original study

INCLUSION CRITERIA	EXCLUSION CRITERIA
• Aged 65+ • Has capacity to provide informed consent. • Is able to read and understand questions written in the English language.	• Lacks capacity to provide informed consent. • Lacks ability to read and understand questions written in the English language. • Is assessed by ward staff as not medically fit to participate, or is for

• Is ready for discharge, defined as a 'patient assessed by the medical team responsible for their care as medically fit to be discharged back to their place of residence'. • Was assessed as ready for discharge and discharged within 'office hours'.	discharge to a new place of residence. • Was assessed as ready for discharge and discharged during 'out of office hours'.

Patients were advised that their participation was voluntary and they were free to withdraw their consent at any time, without their care being affected. Following this, the researcher asked whether the patient had any questions regarding the study, and time was offered for them to read over the information sheet (Appendix 12) and consider whether they wished to participate. If they desired, the researcher then left the patient for at least 30 minutes before returning.

After this period of time, and if the patient consented to take part in the research, the researcher would reiterate the terms of the research and would ask the patient to complete the consent form (Appendix 6) which required the patient to agree explicitly to each term, before agreeing to take part in the project as a whole.

A detailed diagram of all the steps taken to implement the study is described in Figure 5-2.

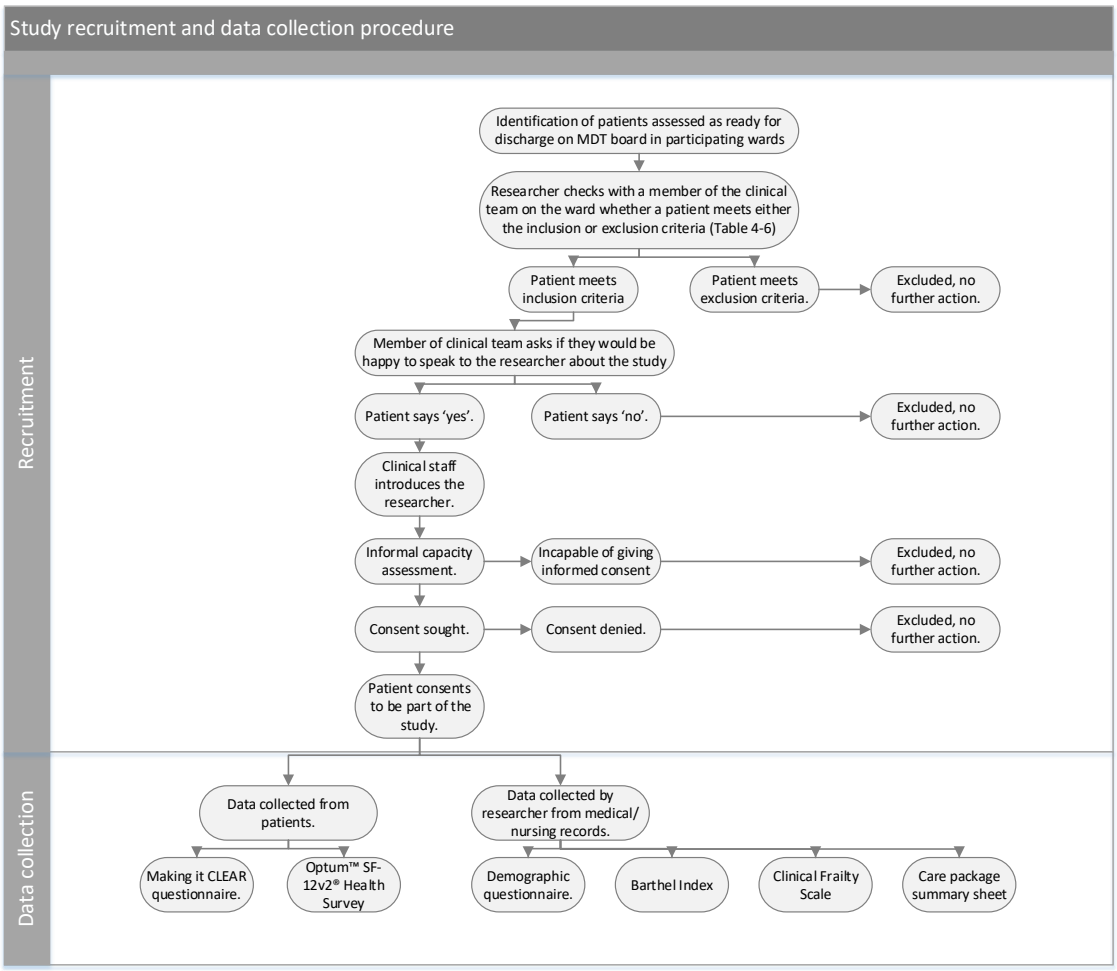

Figure 5-2: Recruitment and data collection procedure

5.5 Data entry and analysis procedure

Data from the completed questionnaires were coded and entered a Microsoft Excel document for electronic storage; this was undertaken onsite at the RIE. Data files were initially stored on an encrypted, password-protected laptop which was kept in a locked cabinet at the hospital. Electronic data were transported from this laptop to securely partitioned QMU servers using NHS encrypted USB sticks, in line with the protocols approved by the Caldicott Guardian and R&D offices. The drive was accessible only to designated users through password-protected log-in.

The researcher input all questionnaires that had been returned with consent, whether all items had been completed or not. Missing data of relevance to this study consisted of three incomplete questionnaires and missing CFS scores for the first 21 participants. These missing

data were deemed to be missing at random (further discussed in Section 6.3). The data from the three participants who did not complete the questionnaires were removed using listwise deletion; multiple imputation was used to impute the missing CFS scores from participants' BI scores.

Data from the Microsoft Excel document were then imported into R (R Core Team 2018) for analysis. The following sections provide an overview of the statistical analysis conducted in the current study.

5.5.1 Factor analysis

Factor analysis is a statistical technique for assessing the unobserved factors that are measured by a larger number of observed variables (Child 1990). There are two types of factor analyses; exploratory and confirmatory.

Exploratory factor analysis (EFA) is a method to explore the underlying structure of a set of measured variables (Child 1990). In comparison, confirmatory factor analysis (CFA) is a method used to verify a factor structure that has been defined a priori based on theory, or on the results of previous EFA with the same set of measured variables (Suhr 2006).

The MiC questionnaire is a relatively new measure of older adults' resilience and, while it has been reported that the first version of the MiC questionnaire, which consisted of 46 items, had satisfactory construct validity, there is currently no published information regarding its underlying factor structure (QMU and NHS Lothian 2015). Additionally, the current, 34-item, MiC questionnaire used in this study includes ten new items which were not analysed as part of the original measure (QMU and NHS Lothian 2015). Furthermore, while the MiC questionnaire contains items relating to both IDoR and EDoR, previous resilience measures have largely overlooked environmental factors influencing older adults' resilience (Windle et al. 2011). This makes it difficult to hypothesise the factor structure which should be observed in the MiC questionnaire, particularly in the EDoR subscale. Consequently, it was appropriate to perform EFA in this study.

5.5.1.1 Exploratory factor analysis

EFA was conducted on the two subscales of the MiC questionnaire to determine whether it is a valid measure of older adults' IDoR and EDoR during hospital admission.

Due to the ordinal measurement scale, item polychoric correlation matrices were computed and OLS regressions were used to estimate model parameters using these matrices (Lee et al. 2012, Holgardo-Tello et al. 2010). Bartlett's Test of Sphericity was used to check that the correlation matrix was significantly different from an identity matrix, where all variables would be perfectly independent of one another; a significant Bartlett's test result implies that the correlation matrix is significantly different and therefore suitable for factor analysis (Field 2012).

The Kaiser-Meyer-Olkin measure verified the sample adequacy for the analyses (Kaiser 1974). KMO values range between zero and one, with values closer to one representing that patterns of correlations in the variables are relatively compact, compact correlations mean that factor analysis should be reliable. KMO values greater than 0.7 indicate good sampling adequacy (Hutcheson and Sofroniou 1999).

Examination of scree plots and parallel analysis (Horn 1965) determined the number of factors to extract for both subscales.

Oblique rotation reflected the assumption that different factors measured by the scale should correlate with one another as such promax rotation criterion were applied to aid factor solution interpretation (Thompson 2004; Field 2012). The significance of factor loadings should be considered in relation to the sample size. Stevens (2002) recommends that with a sample of more than 300 people a factor loading greater than 0.298 should be considered significant, although it is also suggested that items judged to be good reflections of a particular construct of interest should have a loading on the relevant factor greater than 0.4, and their complexity (i.e. loadings on unintended factors) should be minimal (Stevens 2002). Considering 0.4 as a threshold value, an item was identified as cross-loading if it loaded at 0.4 or higher on two or more factors.

A model was judged to have good fit if it had a Tucker-Lewis Index value greater than 0.9 (West et al. 2012). A good-fitting model is one which captures the true covariance between all the items in the questionnaire (Stanley and Edwards 2016). Root mean squared error of approximation was not considered as their standard cut-off rules are often inconsistent when working with categorical data (Clark and Bowles 2018). Consequently, goodness-of-fit was primarily determined based on TLI values, the results of parallel analysis, and 'judgemental criteria' regarding how the model relates to its theoretical underpinnings (Clark and Bowles 2018; Wieland et al. 2018).

5.5.2 Item analysis

Several item analysis techniques were conducted to assess the quality of the items included within each subscale, these were:

5.5.2.1 Item Discrimination

Corrected item-total correlations were calculated for each item to determine whether individual items could discriminate between those who had a low resilience level, and those who had a high resilience level (Nunnally and Bernstein 1994). Nunnally and Bernstein (1994) suggest that poorly discriminating items have an *r* value <0.05, while moderately discriminating items have an *r* value >0.2, and items which discriminate well have an *r* value >0.3.

5.5.2.2 Item Difficulty

Item difficulty values were used to determine whether the subscales contained an acceptable range of item difficulty levels (PearsonVue 2015). Ideally measures should contain a range of item difficulty values, as too many easy or difficult items is not desirable (PearsonVue 2015). Having said this, item difficulty values indicating very easy (<0.20) or very hard (>0.95) items may be problematic (PearsonVue 2015; Lüdecke 2019).

5.5.2.3 Cronbach's α and inter-item correlations

Cronbach's α assessed internal consistency within the whole subscale, that is whether the items measure the same construct, to be reliable a scale should have an α coefficient value of at least 0.7 (de Vaus 2002). It is suggested that this is particularly important when multiple Likert-type items are grouped to form one Likert Scale which aims to measure a latent construct (Sullivan and Artino 2013).

To assess internal consistency and acceptable reliability within factors mean inter-item-correlations were calculated. Cronbach's α was not used due to it being affected by test length; that is a shorter test has a reduced α value irrespective of whether the test is heterogeneous or not (Tavakol and Dennick 2011). Mean inter-item correlations should ideally range between 0.15-0.5, values greater than 0.5 suggest that the factor has a narrower focus (BrckaLorenz et al. 2013).

5.5.3 Descriptive/exploratory analysis

For continuous variables frequency distribution tables and summary statistics were produced. Histograms and response counts were created for categorical variables (e.g. demographic questionnaire).

This descriptive/exploratory analysis was undertaken in order to enable the researcher to familiarise herself with the data, describe the sample, identify patterns and anomalies, provide summary statistics regarding the participants, and to identify possible problems with how the data has been entered and coded, allowing for a general 'cleaning up of the data'.

Frequency distribution tables and histograms were also used to analyse the responses to the MiC questionnaire items, in order to determine which items and factors were scored poorly most frequently, thus determining the areas of 'resilience need' most frequently reported by older people on discharge.

5.5.4 Correlation tests and comparison of means

Data concerning IDoR and EDoR were collected using the MiC questionnaire, which is made up of multiple Likert-type items. While individual Likert-type items provide ordinal data, Likert scales are assumed to provide interval data as multiple Likert-type items are combined, resulting in a number of categories much higher than the ordinal Likert-type items they are calculated from, to create an 'approximately continuous variable' (Norman 2010).

Consequently, following the assessment of their normality using histograms (Appendix 13) the IDoR and EDoR subscales were treated as real-valued, normally-distributed variables. It is suggested that this is unlikely to cause biased results, given research which has demonstrated that parametric tests not only can be used with ordinal data, but also that they are generally more robust than nonparametric tests when analysing ordinal data (Norman 2010).

In view of this, tests for correlation (Pearson's correlational test for real-valued variables, and Spearman's for ordinal variables) were carried out between each continuous independent variable and the IDoR and EDoR subscale scores.

Tests comparing means (Independent T-tests and One-Way Analyses of Variance (ANOVAs)) were used to evaluate the relationship between categorical independent variables and the

MiC subscale scores.

ANOVAs and Kruskal Wallis tests, for parametric and non-parametric data respectively, were also used to assess the relationships between the most prominent resilience needs and variables related to functional ability, health status and care package details.

5.5.5 Ordinary Least Squares Regression

As previously stated, Likert scales are presumed to provide interval data through the creation of an 'approximately continuous variable' (Norman 2010). Consequently, it is appropriate to use OLS regression to estimate the relationship between independent variables and the IDoR and EDoR subscales, rather than ordinal logistic regression.

Three stages of OLS regression were carried out for each MiC questionnaire subscale. The purpose of these analyses was to identify the protective and vulnerability factors associated with the IDoR and EDoR of older adults receiving acute hospital care.

Firstly, a univariable OLS regression stage was used to test for associations between MiC subscale scores and independent variables. Variables which had a significant association ($p<0.1$) with IDoR or EDoR in the univariable stages were carried forward to a successive series of multivariable models.

Variables were grouped based on domains which they measured (e.g. demographics, care packages, health status) and multivariable regression modelling was carried out to assess which variables remained associated with the IDoR and EDoR subscales after being entered into the model together ($p<0.1$). Multicollinearity between variables was also assessed for in these groups. Variables which remained associated were then entered into a successive series of OLS models which were adjusted for preceding groups.

Hypothesised interaction terms were added to the final OLS models, and variables which remained significantly associated ($p<0.05$) were retained in the final multivariable OLS models. Finally, goodness-of-fit diagnostics were carried out for the final regression models, using regression diagnostic plots to validate the model assumptions.

5.5.6 Quantile regression

The OLS regression techniques summarise the relationship between the independent variables and participants' self-rated IDoR and EDoR based on the conditional means. However, this only provides a partial view of the relationships as it assumes that associations between independent and dependent variables are the same at all levels (Austin et al. 2005). Consequently, a drawback to the use of OLS is that it allows, at best, for a partial exploration of how independent variables are associated with older adults' IDoR and EDoR during hospital admission (Austin et al. 2005).

In comparison, quantile regression enables an analyst to relax the common regression slope assumption, allowing for the analysis of the effects of covariates on extreme, rather than average, values (Koenker and Hallock 2001; Beyerlein 2014). As a result, quantile regression is gaining popularity within healthcare research, as it allows researchers to examine how indicators of patients' health status change with patient characteristics, which can facilitate the creation of tailored response plans adapted to the needs of specific populations, particularly the most vulnerable (Austin et al. 2005).

In view of this, quantile regression was undertaken with the final OLS multivariable models to acquire a more comprehensive picture of the differential association of the independent variables at different points in the conditional distributions of the MiC questionnaire subscales. The 20%, 30%, 40%, 50%, 60%, 70% and 80% quantiles were used; the 10% and 90% quantiles were not used due to the sample size at these points in both the IDoR and EDoR distributions being too small, resulting in very wide confidence intervals.

This analysis enabled the researcher to look at whether the independent variables' magnitudes of influence are constant or vary across the spectrum of self-rated IDoR and EDoR scores.

5.5.7 Third-variable effect analysis: mediation analysis

Third-variable effect analysis seeks to explain the effect of a third variable on the association between two other variables and describe why they are related, or under what conditions they are related (Blair 2020). There are two common ways to analyse third-variable effects: mediation analysis and moderation analysis.

Mediation analysis tests a hypothetical causal chain where the independent variable affects a mediating variable which, in turn, affects the dependent variable (Blair 2020). In other words, a mediating variable explains, either fully or partially, the association between the independent variable and the dependent variable. This is often referred to as an indirect effect as it describes the process through which an effect occurs (Baron and Kenny 1986; Blair 2020). If self-efficacy was found to mediate the relationship between frailty and IDoR/EDoR in this study, then the results would suggest that frailty causes a reduction in self-efficacy, leading to reduced IDoR/EDoR. This hypothesis is supported by current literature as increasing frailty is proposed to lead to a frailty identity crisis which can result in impaired psychological well-being; self-efficacy, a positive psychological resource, is then understood to be a key resilience resource for older adults (Andrew et al. 2012, McDougall and Balyer 1998).

In comparison, moderation analysis tests for interactions that determine when associations between variables occur (Blair 2020); put otherwise, moderation analysis assesses for 'differential effects' which exist when the relationship between an independent variable to a dependent variable differs across subsets of individuals (Van Horn et al. 2015). Differential effects are typically evaluated through the use of interaction terms, which assess whether the main effect of an independent variable on a dependent variable is moderated by a third variable (Baron & Kenny 1986). If self-efficacy was found to moderate the relationship between frailty and IDoR/EDoR in this study the findings may demonstrate that there is no association between frailty and IDoR/EDoR when self-efficacy is high, but a large association when self-efficacy is low.

Baron and Kenny (1986) state that moderation analysis is typically appropriate when there is an unexpectedly weak or inconsistent relationship between an independent variable and a dependent variable, while mediation analysis is appropriate in the case of a strong relationship between the two variables. Based on current literature which states that self-efficacy is a key resiliency resource for older adults (Stadtlander et al. 2015), and McClain et al.'s (2018) research which found that older adults' self-efficacy mediated the relationship between older adults' physical health and resilience, it was anticipated that there would be a significant relationship between frailty and IDoR and EDoR in this study. Furthermore, while current literature suggests that frailty may indirectly affect resilience through self-efficacy, there is no evidence to suggest that there is the potential for differential effects dependent

on self-efficacy level. Consequently, it was deemed that mediation analysis, rather than moderation analysis, was the appropriate method to assess the hypothesised role of self-efficacy on the relationship between frailty and IDoR/EDoR.

As a result, it was hypothesised that the relationship between frailty and IDoR/EDoR is either fully or partially accounted for by the relationships between frailty and self-efficacy and self-efficacy and IDoR/EDoR. The mediation analysis calculated the total effect of each level of frailty on both IDoR and EDoR, the indirect effect of each frailty level on both IDoR and EDoR through self-efficacy, and the direct effect of the frailty level on IDoR and EDoR.

In order to conclude that an identified relationship between frailty and IDoR/EDoR is mediated by self-efficacy, analyses needed to confirm that self-efficacy is a significant predictor of self-rated IDoR/EDoR, and the association between IDoR/EDoR and frailty was reduced after adjusting for self-efficacy.

5.6 Conclusion

Understanding the resilience of older adults has the potential to inform interventions which seek to enable older adults to adapt well during critical health-state transitions (Martin 2016). Accordingly, current conceptualisations of resilience have focused on the identification of protective mechanisms and vulnerability factors that promote or reduce resilience following stressful events (Esche and Tanner 2005; Clark et al. 2011).

Still, monitoring resilience is relatively new to healthcare (Martin 2016), and little research has been conducted outwith community settings. Additionally, previous resilience measures have been found to overlook the important influence of environmental resources on an individual's resilience (Windle et al. 2011).

The MiC questionnaire includes items which address both the individual and environmental factors influencing an individual's resilience, however, it is yet unvalidated within acute care settings. In view of this, this study was conducted to determine whether the MiC questionnaire is a valid measure of older adults' IDoR and EDoR during hospital admission, and to identify the protective and vulnerability factors associated with the IDoR and EDoR of older adults receiving acute hospital care.

At present, the dataset used is the sole dataset to contain data pertaining to the resilience, frailty status, and demographics of older adults receiving inpatient care in an acute MoE ward. The objectives of this empirical study were, therefore, met through cross-sectional quantitative analysis of this dataset.

Exploratory factor analysis was used to assess the validity of the MiC questionnaire subscales, while OLS regression and quantile regression techniques were used to identify the protective and vulnerability factors associated with the IDoR and EDoR of older adults receiving acute hospital care, and to determine the relative importance of these factors across different levels of IDoR and EDoR. Item analysis was used to identify the specific resilience needs of the population, and mediation analysis determined the role of self-efficacy in the relationship between participants' frailty and their self-rated IDoR and EDoR scores. This analysis plan is summarised in Figure 5-3. The following chapter details the results from the analysis.

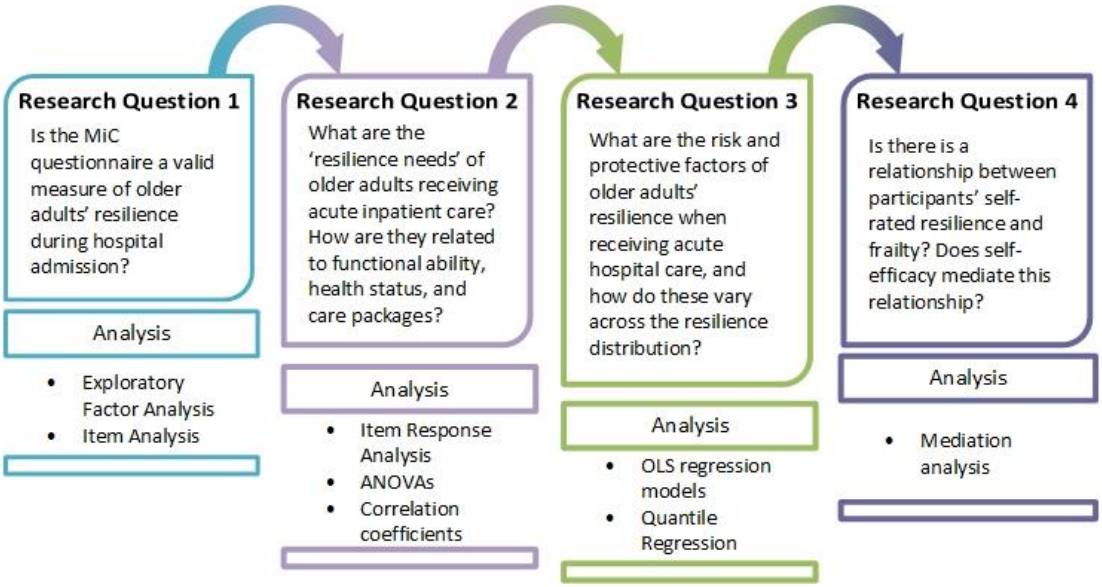

Figure 5-3: Statistical analysis plan

Chapter 6 Results

6.1 Introduction

The preceding chapters overviewed current knowledge about older adults' resilience, as reported in recent research. Research indicates that resilience is a complex construct, determined by both individual and environmental factors, which has the potential to develop the care and quality of life of older adults.

Previous resilience research has concentrated on identifying the protective and vulnerability factors of resilience. These factors are understood to be robust predictors of resilience (Rutter 1987; Lee et al. 2013) and, as resilience is context-dependent, identification of them is often the starting point of resilience research in a new population (Hayman et al. 2017).

Currently, little research has been conducted looking at the resilience of older adults during acute hospital admission. The purpose of the current research was therefore to examine the resilience of a population of older adults recruited during hospital admission in a MoE ward, through identifying the protective and vulnerability factors of their resilience and their resilience needs.

The data used were collected using the Making it CLEAR questionnaire, a recently developed resilience measure, which considers both individual and environmental determinants of resilience. Prior to this study, the MiC questionnaire had not been validated for a population of hospitalised older adults. This chapter, therefore, also presents the EFA conducted to ensure that the MiC questionnaire is a valid measure of older adults' resilience.

This chapter begins with the presentation of the sample characteristics for the study (Section 6.2) and details regarding the completion of the dataset, where data were missing, and how missing data were dealt with (Section 6.3). Following these sections, the chapter presents the analysis conducted for each research question. Section 6.4 consists of the EFA and the item analysis of the two MiC questionnaire subscales, conducted to determine whether the MiC questionnaire is a valid and reliable measure of older adults' resilience during hospital admission. Section 6.5 identifies the 'resilience needs' of the sample and establishes how they are related to functional ability, health status, and care packages. Section 6.6 investigates the protective and vulnerability factors associated with the IDoR and EDoR of

older adults receiving acute hospital care and uses quantile regression to assess how these associations vary across the subscales' score distributions. Finally, Section 6.7 investigates the relationship between frailty and both IDoR and EDoR by looking at whether they are mediated by self-efficacy.

6.2 Sample characteristics

6.2.1 Socio-demographic statistics

Table 6-1 describes the socio-demographic characteristics of the participants included in the present study. The mean age of the participants was 85.36 (6.54) years, and 67.5% were female. Almost 65% of the participants were widowed, while 20.8% were married and the remaining 14.6% were single (either through divorce, separation, or never having been married). Only one member of the sample worked, with almost 94% being retired. Nearly 70% of participants lived alone, while 57.9% lived in their own home, and 21.3% resided in supported accomodation or a nursing home. The large majority were white (99.4%), and just over half of the sample identifed as having a Christian faith (55.3%) while 39.2% said they were not religious.

Table 6-1: Sociodemographic statistics of participants

	ALL (N=418)		**ALL (N=418)**
CONTINUOUS VARIABLES	**MEAN (SD)**	**RANGE**	
Age	85.36 (6.54)	66-102	
CATEGORICAL VARIABLES	**FREQUENCY (%)**		**FREQUENCY (%)**
Gender		**Lives alone?**	
Male	136 (32.5)	Yes	292 (69.9)
Female	282 (67.5)	No	126 (30.1)
Marital Status		**Location of Residence**	
Married	87 (20.8)	Private residence - own home	242 (57.9)
Divorced	27 (6.5)		
Single	19 (4.5)	Private residence – other	87 (20.8)
Widowed	270 (64.6)		
Separated	10 (2.4)	Supported accommodation	80 (19.1)
Never married	5 (1.2)	Nursing home	9 (2.2)
Ethnicity		**Accommodation type**	
White	415 (99.4)		

Mixed or multiple ethnic background	1 (0.2)	Ground floor no stairs	75 (18)
African, Caribbean, Black	1 (0.2)	Ground floor with stairs	226 (54)
Asian	1 (0.2)	First floor or above stairs only	62 (14.8)
		First floor or above with lift	55 (13.2)
Religion		**Employment**	
Christian	231 (55.3)	Employed for wages	1 (0.2)
No religion	164 (39.2)	Retired	391 (93.6)
Other	18 (4.3)	Homemaker	26 (6.2)
Declined to answer	4 (1)		
Unknown	1 (0.2)		

6.2.2 Descriptive statistics for measures

The table below describes the results of the measures completed by the participants, their clinical team, and using their medical notes. The following questionnaires are included: The MiC questionnaire (QMU and NHS Lothian 2015); the Optum ™ SF-12v2 Health Survey (Ware et al. 1996); the BI (Mahoney and Barthel 1965), and the CFS (Rockwood et al. 2005).

Though each questionnaire consists of Likert-type/ordinal items, Likert scales provide interval data as results of multiple ordinal items are combined (ie. the sum or mean is calculated) to create an 'approximately continuous variable' (Norman 2010). This rule applies to the MiC questionnaire, the Optum SF-12v2 health survey, and the BI. As such, means and standard deviations were calculated for each of these measures.

The CFS consists of one ordinal scale. Table 6-2 therefore contains the count values for each CFS category. Multiple imputation was carried out to impute the CFS score for 20 participants; this process is described in the following section.

Table 6-2: Descriptive statistics for measures

	MEAN	SD	RANGE
Making it CLEAR questionnaire			
Individual subdomain	43.23	7.93	24-63
Environment subdomain	24.96	5.16	11-39
Total	68.19	12.16	39-102
Optum SF-12v2			

PCS	31.85	9.31	8.6-59.53
MCS	48.82	8.93	17.79-68.59
Barthel Index	15.66	3.76	1-20
	COUNT	**%**	
Clinical Frailty Scale			
Very Fit	0		
Well	3	0.7	
Managing Well	9	2.2	
Vulnerable	63	15	
Mildly Frail	122	29.2	
Moderately Frail	185	44.3	
Severely Frail	33	7.9	
Very Severely Frail	3	0.7	
Terminally Ill	0		

6.3 Data completion

The dataset from the original study was 99.13% complete, in total there were 454 missing values. Of these missing values, 174 were relevant to the current study and were observed in four domains.

1. Failure to complete measures:

   In total three participants refused to complete the measures, this accounted for around 19% of the missing values in the original dataset. Given the reasons for incompletion (these are reported in Appendix 14 (Data cleaning and quality report)), and the small number of sample members who did not complete the questionnaires, listwise deletion was used to remove the three sample members from the dataset.

   Due to the small number of sample members removed from the dataset neither a paired t-test, which would compare the characteristics of the sample pre- and post- listwise deletion, or an independent t-test, which would compare the characteristics of the remaining sample with that of the removed participants, would provide adequately powered results.

   Consequently, the characteristics of the remaining sample and of the removed participants are described in Table 6-3. Comparison of these values suggests that it is unlikely that listwise deletion of these three participants created selection bias in this

analysis. Furthermore, the small number of removed participants should not significantly reduce the power of this study to detect meaningful effects.

Table 6-3: Characteristics of the removed participants and remaining sample

	REMAINING SAMPLE (N=418)	REMOVED PARTICIPANTS (N=3)
CONTINUOUS VARIABLES	**MEAN (SD)**	**MEAN (SD)**
Age	85.36 (6.54)	86.33 (4.04)
Length of admission	(n=417) 18.6 (19.54)	 11 (10.39)
Length between admission and recruitment	17.02 (19.41)	10.67 (10.69)
Length between recruitment and discharge	1.55 (2.98)	0.33 (0.58)
CATEGORICAL VARIABLES	**FREQUENCY (%)**	**FREQUENCY (%)**
Gender		
Male	136 (32.5)	1 (33.3)
Female	282 (67.5)	2 (66.6)
Marital Status		
Married	87 (20.8)	0
Divorced	27 (6.5)	0
Single	19 (4.5)	0
Widowed	270 (64.6)	3 (100)
Separated	10 (2.4)	0
Never married	5 (1.2)	0
Employment		
Employed for wages	1 (0.2)	0
Retired	391 (93.6)	3 (100)
Homemaker	26 (6.2)	0
Lives alone?		
Yes	292 (69.9)	2 (66.6)
No	126 (30.1)	1 (33.3)
Location of Residence		
Private residence - own home	242 (57.9)	2 (66.6)
Private residence – other	87 (20.8)	0
Supported accommodation	80 (19.1)	0
Nursing home	9 (2.2)	1 (33.3)
Accommodation type		
Ground floor no stairs	75 (18)	2 (66.6)
Ground floor with stairs	226 (54)	1 (33.3)
First floor or above stairs only	62 (14.8)	0
First floor or above with lift	55 (13.2)	0
Ethnicity		

White	415 (99.4)	3 (100)
Mixed or multiple ethnic background	1 (0.2)	0
African, Caribbean, Black	1 (0.2)	0
Asian	1 (0.2)	0
Religion		
Christian	231 (55.3)	2 (66.6)
No religion	164 (39.2)	1 (33.3)
Other	18 (4.3)	0
Declined to answer	4 (1)	0
Unknown	1 (0.2)	0

2. Scottish Index of Multiple Deprivation values:

Data from the SIMD was not available for six sample members (five following listwise deletion). Four of these resided in a nursing home (three within the same nursing home), one lived in supported accommodation, and one lived in their own home in England. For those residing in a nursing home or supported accommodation, data were missing when the property they resided in was the sole property within the postcode area. This missing data accounted for around 14.5% of missing values in the original dataset.

As these data were missing at random, that is it is related to another variable measured, pairwise deletion was used to preserve the questionnaire data collected from these participants (Kang 2013). As the SIMD variables were not found to be related to either subscale of the MiC questionnaire this was not an issue during multiple regression modelling.

3. Religion

While not technically 'missing', non-substantive responses ('prefer not to say') were given by four participants with regards to their religion, while the religious beliefs of two participants were recorded as 'unknown' (one following listwise deletion). These values were removed and pairwise deletion used during analysis (de Vaus 2002). However, during the univariable regression stage of analysis (Section 6.4.5) religion was found to have a significant relationship with the results of the environmental subscale of the MiC questionnaire, and so these five participants were removed for multiple regression modelling which relies on a 'true correlation matrix' (de Vaus 2002).

4. Clinical Frailty Scale score:

The CFS was not completed for the first 21 participants (001-021) (20 following listwise deletion). These data were deemed to be missing completely at random, as the reason for 'missingness' was not related to the CFS value that was supposed to be obtained, or to any other variable measured, but was due to the data not being routinely recorded in patients' medical notes (Kang 2013). This missing data accounted for around 4.6% of missing values in the original dataset.

Spearman's correlation coefficient (r_s) was calculated for the relationship between the BI scores and CFS scores; the significant Spearman correlation coefficient ($r_s = -0.8$; $p < 2.2e^{-16}$) confirmed a strong relationship between the two variables. Multiple imputation was carried out using BI scores to predict the missing CFS values. As the CFS is measured on an ordinal scale a logistic repression imputation strategy was used.

6.4 Determining whether the Making it CLEAR questionnaire is a valid measure of older adults' resilience.

In order to determine whether the MiC questionnaire is a valid measure of older adults' resilience, EFA was conducted on the IDoR and EDoR subscales to identify the underlying structure of the questionnaire items. Item analysis was also undertaken with each subscale to assess the quality of the individual items.

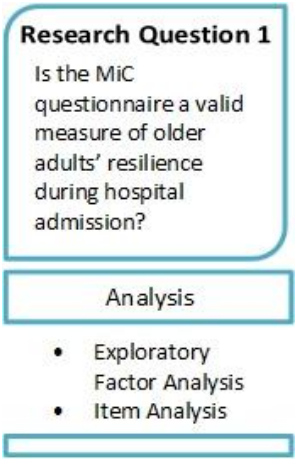

Figure 6-1: Analysis plan for research question one

6.4.1 Exploratory Factor Analysis

Exploratory factor analysis was conducted on the two subscales of the MiC questionnaire, including data on all 418 participants. The IDoR subscale consisted of 21 items, while the EDoR subscale consisted of 13 items.

As described in Section 5.5.1.1, item polychoric correlation matrices, Kaiser-Meyer-Olkin (KMO) measures, and Bartlett's Test of Sphericity were used to determine whether the data were suitable for EFA (Field 2012). Scree plots and parallel analysis determined the number of factors to extract for both subscales (Field 2012). As the factors measured by each subscale were assumed to correlate with one another oblique rotation was performed (Thompson 2004; Field 2012). The model was judged to have good fit based on the criteria of a Tucker-Lewis Index (TLI) value greater than 0.9, the results of parallel analysis, and whether the model was theoretically interpretable (Clark and Bowles 2018; Wieland et al. 2018).

6.4.2 Individual determinants of resilience subscale

The KMO value of the IDoR subscale was 0.92 ('superb' according to Kaiser (1974)), while the KMO values for all individual items were >0.86. Inspection of the polychoric correlation matrix (Appendix 15) and Bartlett's Test of Sphericity indicated that correlations between items were sufficiently large enough for EFA (χ^2 (210) = 4196.994 ($p<0.001$)). Parallel analysis suggested that six factors should be extracted, while inflexions in the scree plot suggested

five or six factors (Figure 6-2). Accordingly, the loadings of five- and six- factor solutions were estimated and examined.

The five-factor solution returned a TLI value of 0.898; a value lower than 0.9 is indicative of under-factoring and suggests that more factors are required (Clark and Bowles 2018). The six-factor solution was therefore preferred with a TLI value of 0.922 and theoretically interpretable factors. This six-factor model accounted for 56% of the common variance.

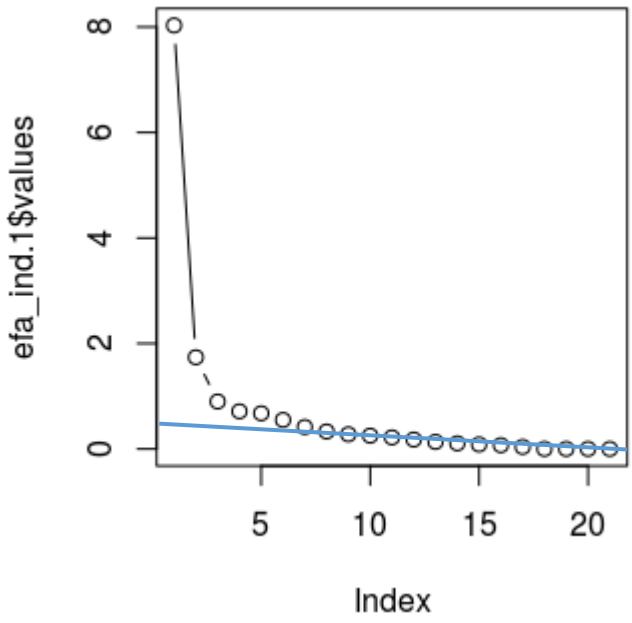

Figure 6-2: IDoR subscale scree plot

The six-factor, promax rotated, solution is shown in Table 6-4. Based on the content of high loading items, these factors were labelled 'Self-efficacy', 'Values', 'Interpersonal skills', 'Life orientation', 'Self-care ability', and 'Process skills'.

Concerning discriminant validity, the factor correlation matrix shows no correlations greater than 0.7 (Table 6-5), with the largest correlation (0.63) being between the factors 'Interpersonal skills' and 'Self-care ability', thus implying that each factor assesses a unique variable (Ellis 2017).

Table 6-4: Six-factor solution for the IDoR subscale.

	FACTOR 1	**FACTOR 2**	**FACTOR 3**	**FACTOR 4**	**FACTOR 5**	**FACTOR 6**
Labels **ITEM**	***Self-efficacy***	***Values***	***Inter-personal skills***	***Life orientation***	***Self-care ability***	***Process skills***
'I am physically able to do the things I need and want to'	0.92					
'I am able to do things on my own'	0.85	*-0.32*				
'I always have enough energy to do the things I need and want to'	0.81					
'I see myself as a healthy person'	0.67					
'I feel in control of my life'	0.49					
'I am a patient person'		0.63				
'I find it easy to accept whatever life throws at me'		0.58				
'I can forgive myself and others'		0.57		*0.33*		
'I am generally happy'		0.49	*0.39*			
'I can see the funny side of life'		*0.38*				
'I have things to look forward to'		*0.31*				
'I have no problems getting along with others and making new friends'			0.81			
'I can always make myself understood to others'			0.71			

'I am happy to help my friends and family'			0.45	*0.32*		
'I have principles I live my life by'				0.66		
'My past experiences have helped me learn about life'				0.59		
'I understand the realities of life'				0.49		
'I can always present myself in the way I want to'					0.92	
'I have no problems taking care of the place where I live'	*0.33*				0.42	
'I can always keep my mind on what I'm doing'						0.63
'I can always think of ways to solve my problems'				*0.31*		*0.39*

**Italics indicates items with low factor loading (<0.40) on the target latent*

Table 6-5: Factor correlation matrix for the IDoR subscale

FACTORS	**1**	**2**	**3**	**4**	**5**	**6**
Self-efficacy	1					
Values	0.51	1				
Interpersonal skills	0.58	0.58	1			
Life orientation	0.38	0.53	0.61	1		
Self-care ability	0.61	0.41	0.63	0.49	1	
Process skills	0.36	0.29	0.27	0.33	0.19	1

6.4.3 Sensitivity analysis

Regarding cross-loading, no items in the IDoR subscale loaded onto two or more factors with loadings greater than 0.4. However, the items 'I can see the funny side of life', 'I have things to look forward to', and 'I can always think of ways to solve my problems' failed to load onto any factor with a loading greater than 0.4.

Sensitivity analysis was carried out by removing each of these items from the analysis. The effect on the goodness-of-fit statistics in doing this is presented in Table 6-6.

Table 6-6: Sensitivity analysis of the IDoR subscale

ITEM(S) REMOVED:	NONE	'I CAN SEE THE FUNNY SIDE OF LIFE'	'I HAVE THINGS TO LOOK FORWARD TO'	'I CAN ALWAYS THINK OF WAYS TO SOLVE MY PROBLEMS'
TLI	0.922	0.93	0.943	0.924
Cronbach's α	0.890	0.885	0.883	0.884
Explained variance	0.56	0.57	0.56	0.56

Removing any one of these items did not significantly improve the fit of the model. Furthermore, when 'I can see the funny side of life' was removed the other two items continued to have a loading of less than 0.4; when 'I have things to look forward to' was removed 'I can see the funny side of life' ceased to load onto a factor, and when 'I can always think of ways to solve my problems' was removed the item 'I can always keep my mind on what I'm doing' ceased to load onto a factor, thus removing all items which assessed a participant's process skills.

Finally, by removing any combination of these three items consequential factor solutions yielded parameter estimates outwith the permissible range (factor loading >1).

'Problematic' items which disturb the interpretability of the solution can be removed, however the purpose of EFA is to assess the latent construct that is being measured, and the aim should be to remove as few items as possible (Maskey et al. 2018). Removal of any of the three items that loaded poorly onto factors was not found to significantly improve the fit of the model, however removal of these items altered the loadings of other items to an extent where theoretically important information would be lost.

As such, the three items previously mentioned were not removed from the questionnaire, and decisions regarding the factors on which items should be retained were informed by the results of the EFA and resilience theory. As such, the items 'I can see the funny side of life' and 'I have things to look forward to' were retained on the factor titled 'values'; while the

item ‘I can always think of ways to solve my problems’ was included on the factor titled ‘process skills’, given that the examples included in the questionnaire were ‘e.g. reorganising appointments, retracing steps to find lost keys’ (Appendix 1).

6.4.4 Item analysis

Item analysis was also undertaken with the IDoR subscale of the MiC questionnaire in order to assess the quality of the individual items in the subscale.

6.4.4.1 Item Discrimination

Corrected item-total correlations (*r*) between each item with the remaining items were calculated to determine whether specific items could discriminate between those who scored poorly in the IDoR subscale and those who scored well. All items in the IDoR subscale of the MiC questionnaire demonstrated good item discrimination values (range: 0.366 – 0.632) (Table 6-7).

6.4.4.2 Item Difficulty

In this analysis, item difficulty values ranged between 0.48 – 0.83 (Table 6-7), indicating an acceptable range of item difficulty values (PearsonVue 2015; Lüdecke 2019). Histograms were produced to visualise the response count for each item of the MiC questionnaire (Appendix 16); this data can also be found in Table 6-13 in Section 6.5.1.

6.4.4.3 Cronbach’s α

Cronbach’s α for the IDoR subscale was 0.890, which indicates that it is a reliable measure of the individual determinants of resilience (de Vaus 2002) (Table 6-7). The figures in the right-hand column indicate how α would change if the item were omitted from the measure; removal of all items would either cause α to decrease, or to remain the same.

To assess internal consistency and acceptable reliability within factors mean inter-item-correlations were calculated. Within the factors mean inter-item correlations were satisfactory, ranging between 0.331 and 0.492 (Table 6-8).

Table 6-7: Item analysis of the IDoR subscale

	DESCRIPTIVE STATISTICS FOR THE IDoR SUBSCALE OF THE MiC QUESTIONNAIRE				
ITEM	**MEAN**	**SD**	**ITEM DIFFICULTY**	**ITEM DISCRIMINATION**	**α IF DELETED**
'I can always present myself in the way I want to'	2.15	0.52	0.72	0.470	0.886
'I have no problems taking care of the place where I live'	1.91	0.61	0.64	0.412	0.888
'I am a patient person'	1.9	0.82	0.63	0.366	0.890
'I find it easy to accept whatever life throws at me'	1.96	0.69	0.65	0.537	0.884
'I can forgive myself and others'	2.19	0.55	0.73	0.438	0.887
'I have things to look forward to'	2.01	0.73	0.67	0.566	0.883
'I can see the funny side of life'	2.4	0.68	0.80	0.524	0.885
'I have principles I live my life by'	2.31	0.62	0.77	0.435	0.887
'My past experiences have helped me learn about life'	2.49	0.56	0.83	0.421	0.887
'I am happy to help my friends and family'	2.49	0.55	0.83	0.452	0.887
'I am generally happy'	2.23	0.62	0.74	0.620	0.882
'I understand the realities of life'	2.33	0.59	0.78	0.441	0.887
'I see myself as a healthy person'	1.63	0.8	0.54	0.446	0.887
'I am able to do things on my own'	1.91	0.79	0.64	0.571	0.883
'I feel in control of my life'	1.91	0.73	0.64	0.632	0.881
'I am physically able to do the things I need and want to'	1.58	0.83	0.53	0.573	0.883

'I always have enough energy to do the things I need and want to'	1.43	0.79	0.48	0.573	0.883
'I can always make myself understood to others'	2.19	0.64	0.73	0.491	0.886
'I have no problems getting along with others and making new friends'	2.29	0.58	0.76	0.498	0.885
'I can always keep my mind on what I am doing'	1.94	0.69	0.65	0.488	0.886
'I can always think of ways to solve my problems'	1.98	0.64	0.66	0.537	0.884
				Cronbach's α	0.890

Table 6-8: Mean inter-item correlations within IDoR factors

FACTOR	MEAN INTER-ITEM CORRELATION
Self-efficacy	0.492
Values	0.348
Inter-personal skills	0.367
Life orientation	0.331
Self-care ability	0.387
Process skills	0.448

6.4.5 Environmental determinants of resilience subscale

The KMO value of the EDoR subscale was 0.84 ('great' according to Kaiser (1974)) while the KMO values for individual items were >0.69. Inspection of the polychoric correlation matrix (Appendix 17) and Bartlett's Test of Sphericity indicated that correlations between items were sufficiently large enough for EFA (χ^2 (78) = 2257.224 ($p<0.001$)). Parallel analysis suggested that five factors should be extracted, while inflexions in the scree plot suggested five or six factors (Figure 6-3). Accordingly, the loadings of five- and six- factor solutions were estimated and examined.

The six-factor solution yielded parameter estimates outwith the permissible range (factor loadings >1). In comparison, the five-factor, promax rotated, solution had a TLI value of 0.936

and yielded well-defined and theoretically interpretable factors (Table 6-9). This five-factor model accounted for 59% of the common variance.

Based on the content of high loading items, these factors were labelled 'Person-environment fit', 'Friends', 'Material Assets', 'Habits', and 'Family'. Furthermore, no items were found to cross-load (load at 0.4 or higher on two or more factors).

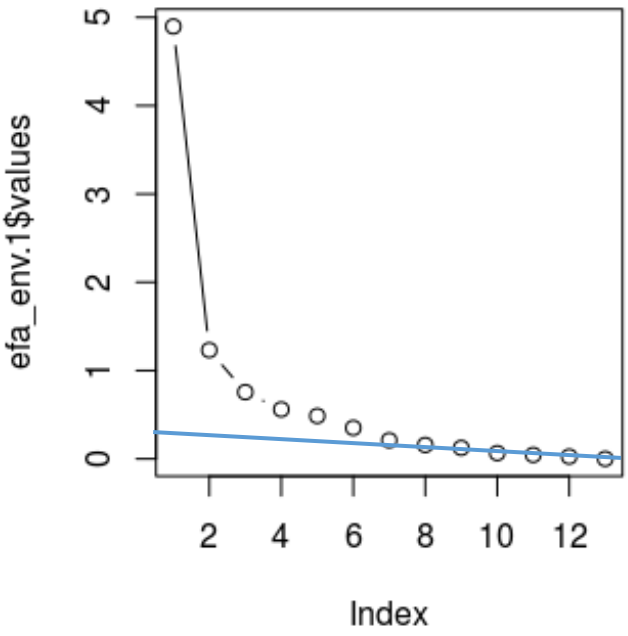

Figure 6-3: EDoR subscale scree plot

Table 6-9: Five-factor solution for the EDoR subscale.

	FACTOR 1	**FACTOR 2**	**FACTOR 3**	**FACTOR 4**	**FACTOR 5**
Labels **ITEM**	***Person-environment fit***	***Friends***	***Material Assets***	***Habits***	***Family***
'I can take part in the leisure activities that I want'	0.75				
'I have additional roles in my community/society'	0.72		*-0.38*		
'I can take part in the social activities that I want'	0.71				

'I can find and use the learning/training resources I want'	0.64				
'I have no problems getting around my home and neighbourhood'	0.44				
'I can find and use community services I need'	0.40				
'I am part of a circle of friends'		0.97			
'My circle of friends helps me get through life's demands'		0.66			
'I live in safe and suitable housing'			0.64		
'I can afford the things that I need'			0.63		
'I am always satisfied with my daily routine'				0.86	
'I have no problems organising my routine so that I can do the things that are important to me'				0.68	
'I have family who support me'					0.68

**Italics indicates items with low factor loading (<0.40) on the target latent variable.*

In terms of discriminant validity factor correlations were acceptable, with the largest correlation (0.59) being between the factors 'Person-environment fit' and 'Habits' (Table 6-10).

Table 6-10: Factor correlation matrix for the EDoR subscale

FACTORS	**1**	**2**	**3**	**4**	**5**
Person-environment fit	1				
Friends	0.57	1			
Material Assets	0.50	0.27	1		
Habits	0.59	0.31	0.59	1	
Family	0.08	0.10	0.22	0.17	1

6.4.6 Item analysis

Item analysis was also undertaken with the EDoR subscale of the MiC questionnaire.

6.4.6.1 Item Discrimination

The majority of items in the subscale demonstrated good item discrimination values (range: 0.21 – 0.681) (Nunnally and Bernstein 1994), while two items were found to have moderate item discrimination ('I have family who support me' and 'I can afford the things that I need') (Table 6-11).

6.4.6.2 Item Difficulty

Item difficulty values ranged between 0.35 – 0.84 (Table 6-11), indicating an acceptable range of item difficulty values (PearsonVue 2015; Lüdecke 2019).

6.4.6.3 Cronbach's α

Cronbach's α for the EDoR subscale was 0.823, which indicates that it is a reliable measure of the environmental determinants of resilience (de Vaus 2002) (Table 6-11). Only through omitting the item titled 'I have family who support me' would α increase, however not substantially. Removal of all other items would cause α to decrease.

Table 6-11: Item analysis of the EDoR subscale

	DESCRIPTIVE STATISTICS FOR THE EDoR SUBSCALE OF THE MiC QUESTIONNAIRE				
ITEM	**MEAN**	**SD**	**ITEM DIFFICULTY**	**ITEM DISCRIMINATION**	**α IF DELETED**
'I can take part in the leisure activities that I want'	1.56	0.78	0.52	0.544	0.804
'I can take part in the social activities that I want'	2.01	0.71	0.67	0.681	0.793
'I can find and use the community services I need'	2.04	0.57	0.68	0.393	0.816
'I can find and use the learning/training resources that I want'	1.74	0.69	0.58	0.475	0.810

'I have additional roles in my community/society'	1.06	0.67	0.35	0.402	0.815
'I am part of a circle of friends'	1.76	0.84	0.59	0.559	0.802
'I have no problems getting around my home and neighbourhood'	1.79	0.79	0.60	0.484	0.809
'I live in safe and suitable housing'	2.53	0.54	0.84	0.404	0.815
'My circle of friends helps me get through life's demands'	1.75	0.84	0.58	0.529	0.805
'I have family who support me'	2.53	0.77	0.84	0.210	0.832
'I can afford the things that I need'	2.33	0.54	0.78	0.297	0.821
'I am always satisfied with my daily routine'	1.83	0.67	0.61	0.483	0.809
'I have no problems organising my routine so that I can do the things that are important to me'	2.03	0.62	0.68	0.582	0.803
				Cronbach's α	**0.823**

Within the factors mean inter-item correlations ranged between 0.308 and 0.683 (Table 6-12). The correlation values for the factors 'Habits' and 'Friends' were higher than the cut-off of 0.5, suggesting that their focus is narrower. However, given that both factors consisted of only two items this is unsurprising; furthermore their mean inter-item correlations were below the cut-off of 0.7 which would be indicative of high intercorrelation and redundant items (BrckaLorenz et al. 2013).

The correlation for the factor 'family' could not be calculated due to it consisting of only one item.

Table 6-12: Mean inter-item correlations within EDoR factors

FACTOR	MEAN INTER-ITEM CORRELATION
Person-environment fit	0.335
Friends	0.683
Material assets	0.308
Habits	0.591
Family	-

6.4.6.4 Sensitivity analysis

As the item 'I have family who support me' was found to have moderate discrimination effectiveness and given the Cronbach's α would increase with its removal, the EFA was repeated without this item included. However, removal of this item resulted in parameter estimates outwith the permissible range (factor loadings >1). Furthermore, the effect of family support is of theoretical importance when considering the resilience of older adults, and the factor analysis suggests that it may be distinct from the impact friendships have. Consequently, this item was retained for further analysis.

6.4.7 Correlation between subscales

As the data for both subscales were normally distributed, the relationship between the two subscales was assessed using a Pearson's product-moment correlation coefficient. The two subscales were found to be strongly correlated $r(416)=0.71$, $p<0.001$.

6.5 Identifying the 'resilience needs' of older adults receiving acute inpatient care, and how they relate to functional ability, health status and care packages.

Following EFA and item analysis, item response analysis was undertaken to identify the MiC questionnaire items scored positively and negatively most frequently by older adults. The factors uncovered in the EFA were then used to group item responses, in order to identify areas of 'resilience need'. The relationships between resilience needs and functional ability, health status, and care package details were then assessed using ANOVAs and correlation coefficients.

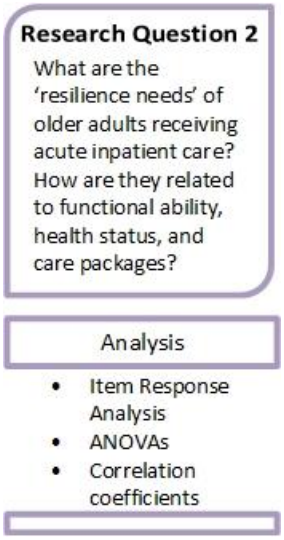

Figure 6-4: Analysis plan for research question two

6.5.1 Item response analysis

The frequency distribution table (Table 6-13) displays the response count for each item of the MiC questionnaire. Histograms were also produced to visualise this data (Appendix 16).

The items that received a response of 'strongly disagree' most often, and were most frequently rated negatively (receiving a response of 'strongly disagree' or 'disagree') were: 'I have additional roles in my community/society', 'I always have enough energy to do the things I need and want to', and 'I am physically able to do the things I need and want to'. 'I can take part in the leisure activities that I want' also received the same number of negative responses as 'I am physically able to do the things I need and want to' (n=185) and was closely followed by 'I see myself as a healthy person' (n=167) and 'My circle of friends helps me get through life's demands' (n=157).

The items that received a response of 'strongly agree' most regularly were: 'I have family who support me' (n=281), 'I live in safe and suitable housing' (n=229), and 'My past experiences have helped me learn about life' (n=216). The five items rated positively (receiving a response of either 'agree' or 'strongly agree') most frequently were more diverse; these were: 'I live in safe and suitable housing' (n=410), 'I am happy to help my

friends and family' (n=409), 'I can afford the things that I need' (n=406), 'My past experiences have helped me learn about life' (n=405), and 'I have no problems getting along with others and making new friends' (n=401).

Seven items received no response of 'strongly disagree'; these were 'I can always present myself in the way I want to', 'I live in safe and suitable housing', 'I can forgive myself and others', 'I have principles I live my life by', 'My past experiences have helped me learn about life', 'I understand the realities of life', and 'I have no problems getting along with others and making new friends'.

Table 6-13: Response counts for the MiC questionnaire items

	MiC ITEM RESPONSE COUNT (%)			
ITEM	**STRONGLY DISAGREE**	**DISAGREE**	**AGREE**	**STRONGLY AGREE**
'I can always present myself in the way I want to'	0	29 (6.94)	298 (71.29)	91 (21.77)
'I have no problems taking care of the place where I live'	9 (2.15)	70 (16.75)	288 (68.90)	51 (12.2)
'I can take part in the leisure activities that I want'	37 (8.85)	148 (35.41)	194 (46.41)	39 (9.33)
'I can take part in the social activities that I want'	10 (2.39)	72 (17.22)	239 (57.18)	97 (23.21)
'I can find and use the community services I need'	6 (1.44)	41 (9.81)	300 (71.77)	71 (16.99)
'I can find and use the learning/training resources that I want'	14 (3.35)	126 (30.14)	233 (55.74)	45 (10.77)
'I have additional roles in my community/society'	72 (17.22)	263 (62.92)	71 (16.99)	12 (2.87)
'I am part of a circle of friends'	26 (6.22)	130 (31.1)	180 (43.06)	82 (19.62)
'I have no problems getting around my home and neighbourhood'	26 (6.22)	104 (24.88)	220 (52.63)	68 (16.27)
'I live in safe and suitable housing'	0	8 (1.91)	181 (43.3)	229 (54.78)
'My circle of friends helps me get through life's demands'	28 (6.7)	129 (30.86)	179 (42.82)	82 (19.62)
'I have family who support me'	13 (3.11)	34 (8.13)	90 (21.53)	281 (67.22)

'I can afford the things that I need'	1 (0.24)	11 (2.63)	255 (61)	151 (36.12)
'I am always satisfied with my daily routine'	11 (2.63)	101 (24.16)	254 (60.77)	52 (12.44)
'I have no problems organising my routine so that I can do the things that are important to me'	4 (0.96)	63 (15.07)	269 (64.35)	82 (19.62)
'I am a patient person'	27 (6.46)	82 (19.62)	213 (50.96)	96 (22.97)
'I find it easy to accept whatever life throws at me'	12 (2.87)	71 (16.99)	255 (61)	80 (19.14)
'I can forgive myself and others'	0	32 (7.66)	276 (66.03)	110 (26.32)
'I have things to look forward to'	8 (1.91)	86 (20.57)	219 (52.39)	105 (25.12)
'I can see the funny side of life'	4 (0.96)	33 (7.89)	174 (41.63)	207 (49.52)
'I have principles I live my life by'	0	35 (8.73)	217 (51.91)	166 (39.71)
'My past experiences have helped me learn about life'	0	13 (3.11)	189 (45.22)	216 (51.67)
'I am happy to help my friends and family'	1 (0.24)	8 (1.91)	194 (46.41)	215 (51.44)
'I am generally happy'	2 (0.48)	38 (9.09)	240 (57.42)	138 (33.01)
'I understand the realities of life'	0	27 (6.46)	226 (54.07)	165 (39.47)
'I see myself as a healthy person'	36 (8.61)	131 (31.34)	201 (48.09)	50 (11.96)
'I am able to do things on my own'	21 (5.02)	88 (21.05)	218 (52.15)	91 (21.77)
'I feel in control of my life'	11 (2.63)	99 (23.68)	224 (53.59)	84 (20.10)
'I am physically able to do the things I need and want to'	41 (9.81)	144 (34.45)	181 (43.3)	52 (12.44)
'I always have enough energy to do the things I need and want to'	44 (10.53)	186 (44.5)	154 (36.84)	34 (8.13)
'I can always make myself understood to others'	4 (0.96)	41 (9.81)	244 (58.37)	129 (30.86)
'I have no problems getting along with others and making new friends'	0	27 (6.46)	241 (57.66)	150 (35.89)

'I can always keep my mind on what I am doing'	6 (1.44)	97 (23.21)	233 (55.74)	82 (19.62)
'I can always think of ways to solve my problems'	2 (0.48)	85 (20.33)	252 (60.29)	79 (18.9)

6.5.2 Identification of resilience needs

Using the factors from the EFA, item responses were grouped, to identify the areas of resilience need most frequently reported by older people during hospital admission (Table 6-14). The mean score for each factor was calculated, and then divided by the number of items included in that factor so that results could be compared.

Table 6-14: Resilience needs identified through subdomain analysis of the MiC questionnaire

SUBSCALE	FACTOR	PROTECTIVE FACTOR	STANDARDISED MEAN FACTOR SCORE
Individual determinants of resilience	Self-efficacy	Self-efficacy	1.69
		Autonomy/perception of control	
		Self-determination	
	Values	Positivity	2.11
		Optimism	
		Spirituality and faith	
		Sense of Humour	
		Forgiveness	
	Interpersonal skills	Friendships	2.33
		Communication skills	
		Caring for others/Altruism	
	Life orientation	Interpretation of life experiences and previous adversities	2.38
		Meaningfulness	
		Accepting one's life course	
	Self-care ability	Physical, emotional, and mental health	2.03
	Process skills	Cognitive functioning	1.96
		Physical, emotional, and mental health	

	Person-environment fit	Availability of community resources	1.70
Environmental determinants of resilience		Community involvement	
		Being part of the physical and social environment	
	Friends	Friendships	1.76
		Neighbours and neighbourliness	
	Material assets	Income	2.43
		Perceived economic resources	
	Habits	Meaningful activity	1.93
		Satisfaction in routine	
	Family	Family support	2.53

Corresponding with the items 'I have additional roles in my community/society', 'I always have enough energy to do the things I need and want to', and 'I am physically able to do the things I need and want to' being 'strongly disagreed' with most frequently, the factors that were scored the worst were 'self-efficacy' and 'person-environment fit'. The factor 'friends' was also scored poorly, especially when compared to the factors 'family' and 'interpersonal skills', which similarly relate to participants' social characteristics, and were among the factors scored most favourably. Table 6-14 displays the protective factors, identified in sections 3.3.1.2 and 3.5.3 that these pertain to.

'Material assets' and 'Life orientation' were the other two factors that were scored well by participants. This is consistent with the frequency distributions of individual items, as 'I live in safe and suitable housing', 'I have principles I live my life by', 'My past experiences have helped me learn about life', and 'I understand the realities of life' received no response of 'strongly disagree'.

6.5.3 Functional ability, health status and care packages

In order to establish how the resilience needs are related to functional ability, health status and care packages, the relationships between the three factors scored most and the functional ability (as measured by the BI), frailty status (as measured by the CFS), and care

package details of the participants were assessed using ANOVAs. The relationship between the resilience needs and perceived physical and mental health (as measured by the SF-12v2 summary scales) were assessed using correlation coefficients.

6.5.3.1 Self-efficacy

One-way ANOVAs were conducted to compare the differences in participants mean 'self-efficacy' factor scores, based on their ability to carry out ADL, their frailty status, and the care package they receive. Normality checks and Bartlett's tests were carried out to ensure that the dependent variable met the required assumptions (normal distribution and homogeneity of variances, respectively). Post hoc comparisons using the Tukey test were carried out. Significant differences are summarised in Table 6-15.

Based on the scores of BI items, significant differences in mean self-efficacy factor scores were seen between participants who were more able and those who required more support to perform ADL or were dependent. This was consistent across nine of the ten BI items, only the item concerning faecal continence did not show significant differences between groups.

Concerning frailty status, participants who were deemed 'moderately frail' or 'severely frail' had significantly lower mean self-efficacy factor scores than those who were less frail. Participants who had a care package before admission or were discharged with a care package were also found to have significantly lower mean self-efficacy factor scores than those who did not ($p<0.001$).

Pearson's and Spearman's correlation coefficients were calculated to assess the relationship between self-efficacy scores and perceived physical and mental health, respectively. The Pearson's correlation coefficient showed a positive relationship between self-efficacy and perceived physical health ($r=0.53$, $p<0.001$), while the Spearman's correlation coefficient found a significant positive relationship between self-efficacy and perceived mental health ($r_s=0.4$, $p<0.001$).

Table 6-15: Significant differences in 'self-efficacy' factor score based on functional ability, frailty status, and care package details

	SELF-EFFICACY SCORE	
VARIABLE	**MEAN (SD)**	**PAIRWISE POST HOC COMPARISON SIGNIFICANCE**
BARTHEL INDEX		
Bladder		
a) Continent	8.82 (2.91)	a and c ***
b) Occasional accident	8.57 (2.75)	b and c *
c) Incontinent	7.41 (3.34)	
Dressing		
a) Independent	9.50 (2.82)	a and b, c ***
b) Requires help	7.93 (2.81)	b and c ***
c) Dependent	5.93 (3.47)	
Bathing		
a) Independent	9.61 (2.84)	a and b ***
b) Dependent	7.74 (2.94)	
Grooming		
a) Independent	9.00 (2.91)	a and b ***
b) Dependent	7.37 (3.01)	
Toileting		
a) Independent	8.87 (2.86)	a and b, c ***
b) Requires help	7.18 (2.92)	b and c *
c) Dependent	5.33 (3.51)	
Feeding		
a) Independent	8.64 (2.92)	a and b ***
b) Requires help	5.54 (3.56)	
Mobility		
a) Independent	8.78 (2.88)	a and b **
b) Requires help	7.09 (2.86)	a and c ***
c) Immobile/wheelchair user	4.84 (3.35)	b and c *
Transfer		
a) Independent	8.78 (2.87)	a and b, c ***
b) Minor help	6.12 (3.08)	
c) Major help/Unable	5.81 (3.46)	
Stairs		
a) Independent	9.64 (2.96)	a and c ***
b) Requires help	8.78 (2.68)	b and c **
c) Unable	7.76 (3.06)	
CLINICAL FRAILTY SCALE		
a) Managing well	10.00 (3.28)	

b) Vulnerable	10.14 (2.69)	a and e ***
c) Mildly frail	9.2 (2.64)	b and d, e ***
d) Moderately frail	7.94 (2.77)	c and d, e ***
e) Severely frail	5.50 (3.40)	d and e ***
CARE PACKAGE		
Care package before admission		
a) No	9.09 (2.93)	a and b ***
b) Yes	7.83 (3.02)	
Care package on discharge		
a) No	9.21 (2.84)	a and b ***
b) Yes	8.04 (3.07)	
Number of days care is provided		
a) 0	9.12 (2.91)	a and c ***
b) other	9.45 (3.42)	
c) 7	8.04 (3.03)	
Number of times a day care is provided		
a) 0	9.12 (2.91)	a and e ***
b) 1	8.23 (3.30)	
c) 2	8.53 (3.18)	
d) 3	8.07 (2.37)	
e) 4	7.65 (3.28)	
f) 5	7.00 (2.00)	

** p<0.05, ** p<0.01, *** p<0.001*

6.5.3.2 Person-environment fit

One-way ANOVAs were conducted to compare the differences in participants' mean 'person-environment fit' factor scores, based on their ability to carry out ADL, their frailty status, and the care package they receive. Normality checks and Bartlett's tests were carried out to ensure that the dependent variable met the required assumptions (normal distribution and homogeneity of variances, respectively). Where the person-environment fit factor score met the assumption of homoscedasticity post hoc comparisons using the Tukey test were carried out. Significant differences are summarised in Table 6-16.

In five of the ANOVAs the person-environment fit factor score was found to be heteroscedastic that is the variance was not homogeneous across groups; the independent variables in these ANOVAs were the bathing item of the BI and all four variables concerning packages of care. As a result, median scores (with interquartile ranges (IQR)) and Kruskal Wallis tests were used to compare the differences in participants' mean rank scores (Table

6-16). Post hoc comparisons were then carried out using the Dunn test (signified by the character † in Table 6-16).

Based on the scores of BI items, significant differences in mean person-environment fit factor scores were seen between participants who were more able and those who required more support to perform ADL or were dependent, with exception to the two items concerning the continence of the participant.

Concerning frailty status, participants who were deemed 'moderately frail' or 'severely frail' had significantly lower mean person-environment fit factor scores than those who were less frail.

Participants who were admitted or discharged with a care package were found to have a significantly lower mean rank person-environment fit factor score than those who did not ($p<0.001$). However, while participants who received care seven days a week had a lower mean rank score than those who received it less frequently, participants who received support less frequently had a greater mean rank score than those who received no care at all.

Pearson's and Spearman's correlation coefficients were calculated to assess the relationship between person-environment fit scores and perceived physical and mental health respectively. The Pearson's correlation coefficient showed a positive relationship between person-environment fit and perceived physical health ($r=0.41$, $p<0.001$), while the Spearman's correlation coefficient found a significant positive relationship between person-environment fit and perceived mental health ($r_s=0.25$, $p<0.001$).

Table 6-16: Significant differences in person-environment fit factor score based on functional ability, frailty status, and care package details

	'PERSON-ENVIRONMENT FIT' SCORE	
VARIABLE	**MEAN (SD)/ MEDIAN (IQR)**	**PAIRWISE POST HOC COMPARISON SIGNIFICANCE**
BARTHEL INDEX		
Dressing		
a) Independent	10.87 (3.02)	a and b ***
b) Requires help	9.75 (2.54)	a and c *
c) Dependent	9.33 (2.78)	

Bathing†		
a) Independent	11 (9-13)	a and b ***
b) Dependent	10 (8-11)	
Grooming		
a) Independent	10.56 (2.85)	a and b ***
b) Dependent	9.47 (2.66)	
Toileting		
a) Independent	10.41 (2.83)	a and b **
b) Requires help	9.25 (2.47)	
c) Dependent	9.38 (3.12)	
Feeding		
a) Independent	10.28 (2.82)	a and b *
b) Requires help	8.92 (2.76)	
Mobility		
a) Independent	10.35 (2.79)	a and c *
b) Requires help	9.40 (2.76)	
c) Immobile/wheelchair user	8.74 (3.23)	
Transfer		
a) Independent	10.39 (2.77)	a and b ***
b) Minor help	8.31 (2.75)	
c) Major hep/Unable	9.19 (3.06)	
Stairs		
a) Independent	11.16 (2.83)	a and c ***
b) Requires help	10.37 (2.61)	
c) Unable	9.68 (2.82)	
CLINICAL FRAILTY SCALE		
a) Managing well	12.67 (3.11)	
b) Vulnerable	11.47 (2.86)	a and d, e ***
c) Mildly frail	10.75 (2.55)	b and d, e ***
d) Moderately frail	9.51 (2.56)	c and d , e ***
e) Severely frail	9.08 (3.36)	
CARE PACKAGE		
Care package before admission†		
a) No	11 (8-13)	a and b ***
b) Yes	10 (9-11)	
Care package on discharge†		
a) No	11 (9-13)	a and b ***
b) Yes	10 (8-11)	
Number of days care is provided†		
a) 0	11 (9-13)	a and c ***
b) other	12 (10-13)	b and c *
c) 7	10 (8-11)	
Number of times a day care is provided†		

a) 0	11 (9-13)	a and c, e **
b) 1	11 (9-12.5)	a and d ***
c) 2	10 (8-11)	b and d **
d) 3	9 (8-11)	
e) 4	10 (9-11)	
f) 5	10 (9-11)	

** p<0.05, ** p<0.01, *** p<0.001*
† Kruskal Wallis test and Dunn test used due to heteroscedasticity, median score and IQR is displayed

6.5.3.3 Friends

Kruskal Wallis tests were conducted to compare the differences in participants' mean 'friends' factor scores, based on their ability to carry out ADL, their frailty status, and the care package they receive. Kruskal Wallis tests were used as the results of normality checks had demonstrated that the friends factor was not normally distributed. Considering this, Levene tests were carried out to ensure homogeneity of variances. Post hoc comparisons using the Dunn test were carried out. Significant differences are summarised in Table 6-17.

Only for two of the BI items ('Bathing' and 'Transfer') were significant differences in mean rank friends factor scores seen between participants who were more able and those who required more support to perform ADL or were dependent.

Concerning frailty status, participants who were deemed 'mildly frail', 'moderately frail' or 'severely frail' had significantly lower mean rank friends factor scores than those who were less frail.

Participants who had a care package before admission or were discharged with a care package were found to have significantly lower mean rank friends factor scores than those who did not ($p<0.01$), and consistently those who received a greater number of carer visits a day had significantly lower mean rank friends factor scores than those who received a lesser amount. However, while participants who received care seven days a week had a significantly lower mean rank score than those who received it less frequently, participants who received support less frequently had a significantly greater mean rank score than those who received no care at all ($p<0.05$).

Pearson's and Spearman's correlation coefficients were calculated to assess the relationship between friends factor scores and perceived physical and mental health respectively. The Pearson's correlation coefficient showed a positive relationship between friends factor score and perceived physical health ($r=0.22$, $p<0.001$), however the Spearman's correlation

coefficient did not find a significant relationship between friends factor score and perceived mental health (r_s=0.07, p=0.16).

Table 6-17: Significant differences in friends factor score based on functional ability, frailty status, and care package details

	'FRIENDS' SCORE	
VARIABLE	**MEDIAN (IQR)**	**PAIRWISE POST HOC COMPARISON SIGNIFICANCE**
BARTHEL INDEX		
Bathing		
a) Independent	4 (3-5)	a and b ***
b) Dependent	4 (2-4)	
Transfer		
a) Independent	4 (2-4.5)	a and b, c *
b) Minor help	3 (2-4)	b and c **
c) Major help/Unable	4 (4-5)	
CLINICAL FRAILTY SCALE		
a) Managing well	6 (3-6)	
b) Vulnerable	4 (3-5)	a and c, e *
c) Mildly frail	4 (2-5)	a and d **
d) Moderately frail	3 (2-4)	b and d **
e) Severely frail	4 (2-5)	c and d *
CARE PACKAGE		
Informal carer on admission		
a) No	4 (2-5)	a and b **
b) Yes	3 (2-4)	
Care package on discharge		
a) No	4 (2.25-5)	a and b **
b) Yes	4 (2-4)	
Number of days care is provided		
a) 0	4 (3-5)	a and c **
b) other	4 (4-6)	a and b *
c) 7	4 (2-4)	b and c **
Number of times a day care is provided		
a) 0	4 (3-5)	a and c **
b) 1	4 (3-5)	a and d ***
c) 2	4 (2-4)	b and c **
d) 3	3 (2-4)	b and d ***
e) 4	4 (2-4)	b and e *
f) 5	3 (2-4)	d and e *

** p<0.05, ** p<0.01, *** p<0.001*

6.6 Identifying the association of protective and vulnerability factors with resilience of older adults receiving acute hospital care, and how this association varies across the resilience distribution.

In order to identify the protective and vulnerability factors associated with the resilience of older adults receiving inpatient care in an acute MoE ward a series of regression stages were carried out.

These consisted of several univariable and multivariable OLS regression models, to assess the association between IDoR or EDoR and the independent variables. The independent variables included in the final multivariable OLS models were then entered in quantile regression models, to investigate their differential effect across the spectrum of scores for the IDoR and EDoR subscales.

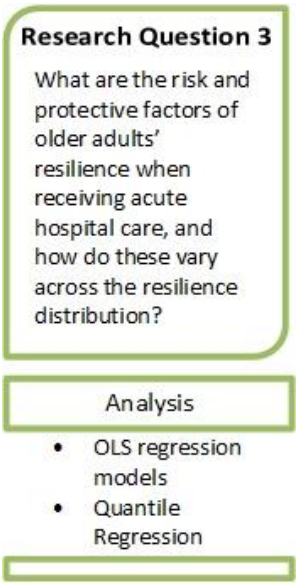

Figure 6-5: Analysis plan for research question three

6.6.1 Preparing the independent variables

Before the regression stages were undertaken it was important to ensure that the independent variables were prepared properly, especially as many of the independent variables included in this study are categorical. Categorical variables can be the source of much difficulty in modelling due to having too many overall levels, having levels that rarely occur, or having one level that almost always occurs (Wielenga 2007).

Looking at the response counts in each level of the categorical independent variables (Appendix 18), it was clear that in this study the latter two of these issues were present. This was addressed in two ways:

Firstly, where there was virtually no variability in participant responses, and therefore no information to enable the regression models to differentiate between possible outcomes, variables were removed from the regression analysis. This almost exclusively occurred where variables had binary responses, with the exception of ethnicity (where all but three

participants were 'White, Scottish') and employment (where only one participant was employed, with all others stating they were 'retired' or 'homemakers').

Secondly, where small numbers were present in a level of an ordinal categorical variable, and it made logical sense to do so, levels were combined to avoid redundant levels which would have minimal chance of making an impact on model fit (Wielenga 2007). The combined variables are specified in Table 6-18.

Table 6-18: Combined levels of categorical variables

ORIGINAL LEVELS	COMBINED LEVEL
Martial state:	
'divorced' and 'separated'	'separated'
'single' and 'never married'	'single'
Barthel Index - bowels:	
'incontinent' and 'accident'	'not fully continent'
Barthel Index - feeding:	
'dependent' and 'requires some help'	'not fully independent'
Barthel Index - transfer:	
'unable' and 'major help'	'major help ± sitting balance'
Barthel Index - mobility:	
'immobile' and 'wheelchair'	'immobile or wheelchair user'
PoC on discharge:	
'yes_funded' and 'yes_private'	'yes'
PoC onset:	
'defined time-lapse' and 'undefined time-lapse'	'after a time-lapse'
PoC days:	
1, 2, 3, 4, 5 and 6	'Other'
CFS score:	
'well' and 'managing well'	'managing well'
'severely frail' and 'very severely frail'	'severely frail'

Multicollinearity was assessed for in four groups. These groups consisted of the independent variables associated with (1) participants' packages of care, (2) medical diagnoses, (3) BI items, and (4) between the total scores of the SF-12v2 PCS, SF-12v2 MCS, BI, and CFS. Multicollinearity was found only in the first group, where the variables 'Is a package of care required?', 'How many times a day is package of care provided?', and 'Number of carers at

each package of care visits' were found to have aliased coefficients, that is the variables were linearly dependent on others, and thus were not included in the multiple regression models.

Continuous variables were not centred, as it was deemed that any multicollinearity would not be with issues of measurement, but with 'essential' multicollinearity, that is, a real correlation between two variables (Iacobucci et al. 2016). Furthermore, the continuous independent variables already had meaningful zero values, and so centring the variables would not increase interpretability of the results (Dalal and Zickar 2012).

After the preparation of the independent variables T-tests, ANOVAs, and tests for correlation were used to evaluate the relationship between the independent variables and both the IDoR and EDoR subscales (Appendix 19).

6.6.2 The Protective and Vulnerability Factors of Individual Determinants of Resilience

6.6.2.1 Ordinary Least Square Regression

Linear regression models were produced to assess the associations between the independent variables and IDoR. The regression modelling consisted of three stages:

Firstly, a univariable stage was conducted, with each variable in turn, to identify those variables which were associated with IDoR ($p<0.1$) (see Appendix 20 for univariable regression estimates).

Secondly, variables which were significantly associated with IDoR in the univariable stage, and that assessed similar domains, were entered in a series of multivariate linear regression models (Table 6-19).

Table 6-19: Regression estimates between independent variables and IDoR

VARIABLE	REGRESSION ESTIMATES		
	CRUDE	ADJUSTED†	ADJUSTED⁎
FIRST LEVEL			
Intercept	-	43.32 *** (41.52, 45.1)	-
Marital state			-

(reference Married)	0.42	0.51	
Widowed	(-1.49, 2.34)	(-1.41, 2.43)	
	3.69*	3.78 *	
Separated	(0.64, 6.74)	(0.89, 6.88)	
	-0.09	0.07 *	
Single	(-3.67, 3.49)	(-3.5, 3.65)	
Religion (reference Christian)			
Atheist	-1.64 *	-1.88 *	-
	(-3.23, -0.06)	(-3.47, -0.29)	
Other	0.81	0.28	
	(-2.99, 3.49)	(-3.54, 4.1)	
SECOND LEVEL			
Intercept	-	46.29 ***	46.61 ***
		(41.75, 50.82)	(42.05, 51.16)
CFS score (reference Managing well)			
Vulnerable	2.33	2.27	1.91
	(-2.35, 7.00)	(-2.36, 6.9)	(-2.68, 6.51)
Mildly frail	-1.13	-1.09	-1.60
	(-5.63, 3.36)	(-5.54, 3.37)	(-6.00, 2.8)
Moderately frail	-3.95 *	-3.89	-4.41 *
	(-8.38, 0.47)	(-8.03, 0.53)	(-8.74, -0.08)
Severely frail	-6.31 *	-6.55 **	-7.01 ***
	(-11.26, -1.35)	(-11.47, -1.64)	(-11.88, -2.14)
Admitted with shortness of breath (reference No)			
Yes	2.48 *	2.63 **	2.85 **
	(0.36, 4.6)	(0.61, 4.66)	(0.85, 4.86)
Diagnosed with a condition of the digestive system (reference No)			
Yes	-2.3 *	-1.98 *	-1.51
	(-4.78, 0.13)	(-4.3, 0.34)	(-3.81, 0.79)
Number of conditions the patient was diagnosed with (reference One)			
Two	0.8	0.87	-
	(-0.83, 2.45)	(-0.68, 2.42	
Three	-2.2 *	-1.5	
	(-4.56, 0.15)	(-3.72, 0.72)	
Past medical history of eye condition (reference No)			-

Yes	-1.8 * (-3.61, -0.01)	-1.11 (-2.9, 0.68)	
Past medical history of mental health condition (reference No)			
Yes	-2.77 ** (-4.75, -0.79)	-2.34 * (-4.32, -0.35)	-2.79 ** (-4.67, -0.91)
Number of past medical health conditions	-0.6 * (-1.09, -0.11)	-0.1 (-0.62, 0.42)	-
THIRD LEVEL			
Intercept	-	46.44 *** (44.8, 48.09)	46.62 *** (42.05, 51.18)
Barthel Index - bathing (reference Independent)			
Dependent	-4.27 *** (-5.78, -2.75)	-2.22 * (-4.85, 0.41)	-1.14 (-3.28, 0.99)
Barthel Index - bladder (reference Continent)			
Occasional accident	-0.52 (-2.64, 1.6)	0.53 (-1.57, 2.64)	-
Incontinent	-2.69 ** (-4.55, -0.83)	-0.79 (-2.88, 1.3)	
Barthel Index - grooming (reference Independent)			-
Dependent	-3.63 *** (-5.21, -2.04)	-1.01 (-3.16, 1.14)	
Barthel Index - dressing (reference Independent)			
Requires some help	-3.82 *** (-5.36, -2.29)	-1.02 (-3.78, 1.74)	-
Dependent	-5.71 *** (-8.68, -2.73)	-0.78 (-5.93, 4.36)	
Barthel Index - feeding (reference Independent)			-
Requires help	-4.22 * (-7.48, -0.96)	-1.68 (-5.67, 2.31)	
Barthel Index - mobility (reference Independent)			
Requires help	-2.56 * (-5.29, 0.17)	-0.77 (-3.91, 2.37)	0.58 (-2.34, 3.49)
Immobile or uses a wheelchair	-5.15 ** (-8.78, -1.52)	-6.07 * (-12.26, 0.12)	-1.98 (-6.19, 12.24)
Barthel Index - stairs			-

(reference Independent)			
Requires help	-2.06 *	-1.03	
	(-5.62, -1.21)	(-3.19, 1.14)	
Unable	-2.96 **	-0.6	
	(-4.85, -1.08)	(-2.65, 1.45)	
Barthel Index - toilet use			
(reference Independent)			
Requires some help	-3.42 **	0.15	-
	(-5.62, -1.21)	(-2.56, 2.86)	
Dependent	-3.59 *	2.02	
	(-7.05, -0.12)	(-4.01, 8.05)	
Barthel Index - transfer			
(reference Independent)			
Minor help	-5.05 **	-2.67	-
	(-8.18, -1.93)	(-6.18, 0.84)	
Major help or Unable	-2.53	3.75	
	(-5.98, -0.12)	(-2.03, 9.52)	
FOURTH LEVEL			
Intercept	-	16.59 ***	20.20 ***
		(12.21, 20.97)	(13.70, 23.7)
Optum SF-12v2 - PCS	0.29 ***	0.31 ***	0.27 ***
	(0.21, 0.37)	(0.23, 0.38)	(0.2, 0.35)
Optum SF-12v2 - MCS	0.33 ***	0.35 ***	0.30 ***
	(0.25, 0.41)	(0.27, 0.42)	(0.23, 0.38)
FIFTH LEVEL			
Intercept	-	45.48 ***	19.99 ***
		(44.16, 46.8)	(13.51, 26.47)
Care package before admission			
(reference No)			-
Yes	-2.82 ***	-1.56	
	(-4.33, -1.32)	(-3.72, 0.59)	
Care package on discharge			
(reference No)			-
Yes	-3.15 ***	-1.26	
	(-4.71, -1.59)	(-7.35, 4.83)	
Care package onset			
(reference No PoC)			
On discharge	-3.48 ***	-1.24	
	(-5.13, -1.83)	(-9.03, 6.55)	-
After time-lapse	-2.43	-2.08	
	(-5.66, 0.81)	(-8.12, 3.96)	
After intermediate care	-0.77	0.58	

	(-5.79, 4.26)	(-7.51, 8.67)	
Days of PoC provision (reference 0)			
7	-3.29 ***	0.01	-0.57
	(-4.86, -1.73)	(-4.58, 4.61)	(-2.15, 1.01)
Other	3.27	6.77*	4.04*
	(-1.49, 8.03)	(0.44, 13.1)	(-0.01, 8.09)

† Adjusted for variables in the level; ⨯ Adjusted for precedent levels
** p <0.1; ** p<0.01; ***p<0.001*

Finally, all variables that were still associated with IDoR (p<0.1), after being adjusted for variables within their level and the levels preceding them, were entered into a fully adjusted model. Hypothesised interaction terms between the final independent variables were also added, to ensure that the model was specified correctly (Table 6-20). In the adjusted models, the magnitudes of association between the independent variables and IDoR were estimated using unstandardised coefficients and their associated 95% confidence intervals, considering p<0.05 as significant; as the interaction terms were not significant after inclusion they were dropped from the final model. Variables with a p value >0.05 were also removed from the final model.

Table 6-20: Adjusted IDoR regression model with interaction terms added

	FULLY ADJUSTED MODEL		**FULLY ADJUSTED MODEL WITH INTERACTION TERMS**	
VARIABLE	**REGRESSION ESTIMATE (CI)**	**P VALUE**	**REGRESSION ESTIMATE (CI)**	**P VALUE**
Intercept	19.99	$3.03e^{-9}$	8.87	0.54
	(13.51, 26.46)		(-19.25, 36.99)	
Marital status (reference Married)				
Widowed	-0.39	0.64	-0.26	0.76
	(-2.03, 1.25)		(-1.93, 1.42)	
Separated	3.16	0.02	3.57	0.009
	(0.55, 5.78)		(0.9, 6.24)	
Single	0.09	0.95	-0.06	0.97
	(-2.92, 3.10)		(-3.12, 2.99)	
Religion (reference Christian)				
Atheist	-1.21	0.08	-1.22	0.08
	(-2.54, 0.13)		(-2.58, 0.13)	

Other	0.94 (-2.28, 4.16)	0.57	1.50 (-1.83, 4.84)	0.38
Admitted with shortness of breath (reference No)	1.81 (-0.002, 3.62)	0.06	1.71 (-0.12, 3.53)	0.07
Past medical history of a mental health condition (reference No)	-0.72 (-2.47, 1.03)	0.42	-0.59 (-2.36, 1.18)	0.51
CFS score (reference Managing well)				
Vulnerable	3.04 (-1.01, 7.18)	0.15	12.32 (-19.2, 43.84)	0.44
Mildly frail	0.52 (-3.52, 4.55)	0.80	15.66 (-13.83, 45.15)	0.3
Moderately frail	-0.8 (-4.92, 3.32)	0.70	7.63 (-21.13, 36.39)	0.60
Severely frail	-2.01 (-6.65, 2.62)	0.39	8.91 (-22.36, 40.18)	0.58
Optum SF-12v2 - PCS	0.27 (0.2, 0.35)	$2.8e^{-12}$	0.77 (0.02, 1.52)	0.04
Optum SF-12v2 - MCS	0.31 (0.23, 0.38)	$2.3e^{-14}$	0.07 (-0.29, 0.43)	0.69
Days of PoC provision (reference 0)				
7	-0.56 (-2.15, 1.01)	0.48	-0.59 (-2.19, 1.01)	0.47
Other	4.04 (-0.01, 8.09)	0.05	4.01 (-0.1, 8.12)	0.06
CFS score* SF-12v2 - PCS				
Vulnerable			-0.41 (-1.19, 0.36)	0.3
Mildly frail			-0.55 (-1.31, 0.21)	0.16
Moderately frail	-	-	-0.50 (-1.26, 0.25)	0.19
Severely frail			-0.39 (-1.18, 0.4)	0.33
CFS score* SF-12v2 - MCS				
Vulnerable			0.21 (-0.21, 0.63)	0.32
Mildly frail	-	-	0.19 (-0.2, 0.58)	0.34
Moderately frail			0.29	0.12

Severely frail			(-0.08, 0.67) 0.18 (-0.25, 0.61)	0.40
BIC		2808.03		2850.089
AIC		2739.63		2749.5
ADJUSTED R^2		0.3216		0.3178

6.6.2.2 Goodness of Fit

Regression diagnostic plots were used to investigate whether there were any influential observations, outliers, or leverage points.

The influence of each observation on the regression coefficients was examined using a Cook's Distance and a Residuals versus Leverage plot (Figure 6-6). In this model, observation 262 had a larger Cook's distance than the other data points, however the Residuals versus Leverage plot did not suggest that they were overly influential to the regression results, with the Cook's distance lines not being visible on the plot (Kim 2015).

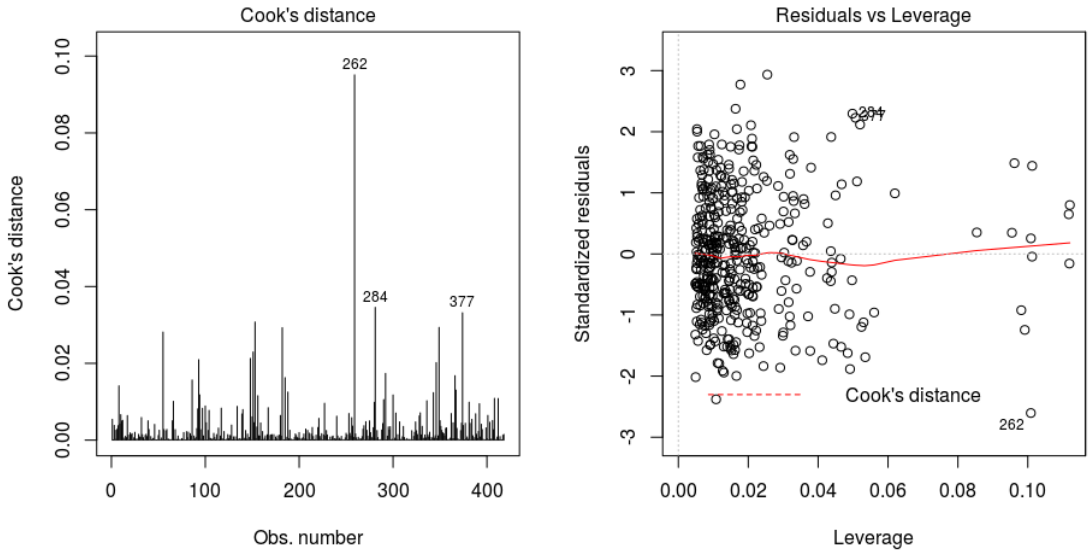

Figure 6-6: Cook's Distance plot and the Residuals vs Leverage plot for the IDoR regression model

Both the Residuals versus Fitted values and the Scale-Location plots (Figure 6-7) supported the assumption of homoscedasticity, with no patterns being seen in the residuals, which were also equally spread around the y=0 line in the plot of Residuals versus Fitted values (Kim 2015).

Residuals were approximately normally distributed, with most observations sitting nicely along the 45-degree line in the QQ-plot (Figure 6-8) (Kim 2015).

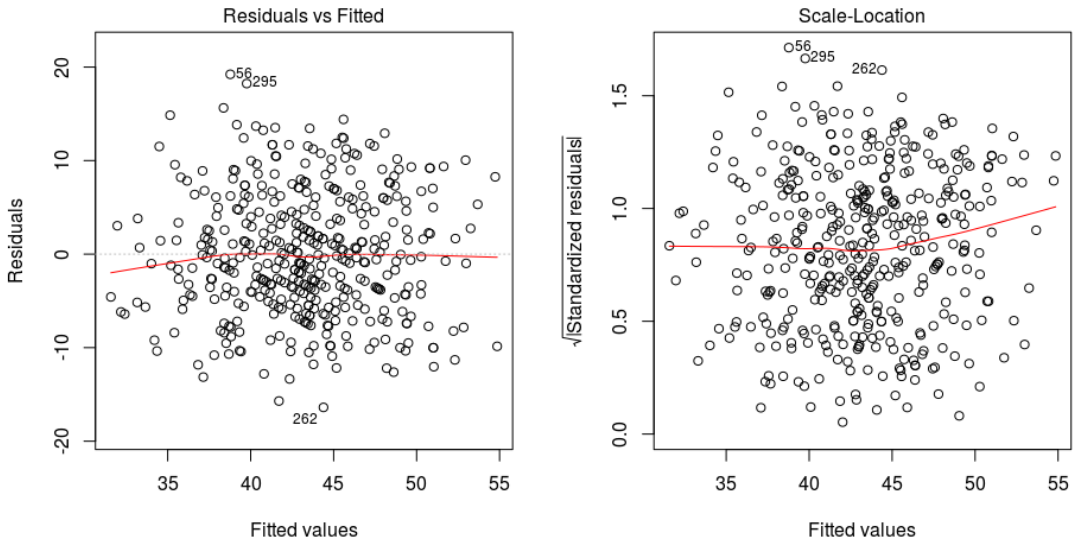

Figure 6-7: Residuals vs Fitted Values plot and the Scale-Location plot for the IDoR regression model

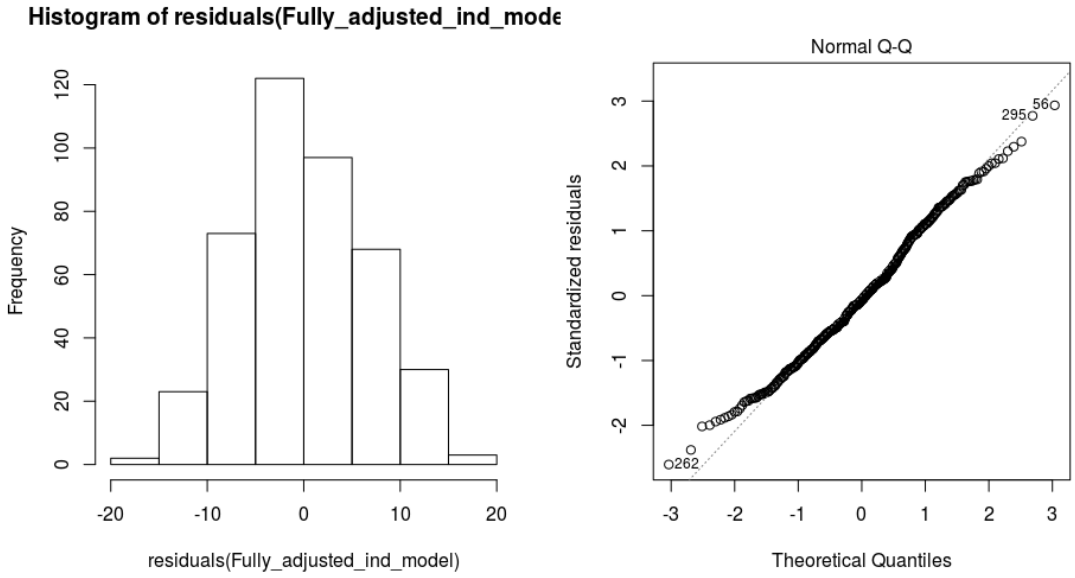

Figure 6-8: Histogram of Residuals and QQ-Plot for the IDoR regression model

The final multiple regression model was used to compare the actual versus predicted IDoR subscale scores for the few observations which deviated slightly from the line (Table 6-21). Some discrepancy was seen, and examination of other potential predictor variables revealed

that these participants were female, were all aged over 85, and were all independently mobile.

Table 6-21: Observations which deviate in QQ plot for the IDoR regression model

	56	**262**	**295**
Marital state	Married	Widowed	Widowed
Admitted with shortness of breath	No	No	Yes
Optum SF-12v2: PCS	43.75	29.31	36.48
Optum SF-12v2: MCS	47.35	44.19	58.96
PoC Days	7	7	0
Actual MiC Individual score	52	41	59
Predicted MiC Individual score	45	40	49
COMMONALITIES			
Gender	Female	Female	Female
Age	96	92	86
Barthel Index - mobility	Independent	Independent	Independent

These variables were added individually to the final multiple regression model, however, only 'gender' was significant ($p<0.05$) when added, and therefore included, in the final model (Table 6-22).

Table 6-22: P values of variables added to the IDoR regression model

VARIABLE	**P VALUE**
Gender (reference Male)	
Female	0.01
Age	0.14
Barthel Index - mobility (reference Independent)	
Help	0.62
Immobile/ Wheelchair user	0.23
Age and Gender	
Age	0.14
Gender	0.01

Regression modelling was undertaken to explain the IDoR score of older adults receiving acute hospital inpatient care, based on a variety of socio-demographic and clinical variables. The final regression model included the data from 408 participants as ten observations were removed due to missing data (five with missing SIMD data and five with unknown/non-substantive responses regarding religion).

A significant regression equation was found (F (8, 409) = 24.39, p<0.001), with an adjusted R^2 of 0.3098. Based on the OLS analysis results, the factors gender, marital state, perceived physical and mental health status (as measured by the Optum SF-12v2), and the number of days a care package is provided explained 30.98% of the variance in IDoR score.

Participants' IDoR subscale score is equal to 16.99 + 1.9 (gender) - 0.89 (widowed) + 2.86 (separated) + 0.32 (single) + 0.31 (Optum SF-12v2: PCS score) + 0.34 (Optum SF-12v2: MCS score) - 2.1 (PoC days: 7) + 3.68 (PoC days: other); where gender is coded 0 = male, 1 = female; and 'marital status: separated', 'marital status: widowed', 'marital status: single', 'PoC days: 7' and 'PoC days: other' are coded 0 = no, 1 = yes (Table 6-23).

Significant results demonstrated that participants who were female had a greater resilience score by 1.9 than those who were male, while those who were separated had a greater resilience score by 2.86 than those who were married. Participants' resilience score increased by 0.31 and 0.33 for each unit increase in Optum SF-12v2 PCS and MCS scores, respectively.

Regarding packages of care, participants' resilience scores decreased by 2.1 if their PoC was provided seven days a week (reference No PoC).

Table 6-23: Final adjusted IDoR regression model

VARIABLE	REGRESSION ESTIMATE	P VALUE
Intercept	16.99 (12.38, 21.60)	$2.25e^{-12}$
Gender (reference Male)		
Female	1.9 (0.46, 3.34)	0.01
Marital status (reference Married)		
Widowed	-0.89 (-2.61, 0.84)	0.31
Separated	2.86 (0.27, 5.45)	0.03
Single	0.32 (-2.71, 3.36)	0.83
Optum SF-12v2 - PCS	0.31 (0.24, 0.38)	<0.001
Optum SF-12v2 - MCS	0.34 (0.27, 0.41)	<0.001
Number of days PoC is provided (reference 0)		
7	-2.10 (-3.47, -0.73)	0.003
Other	3.68 (-0.39, 7.75)	0.08
BIC		**2813.92**
AIC		**2773.57**
ADJUSTED R^2		**0.3098**

The final model was checked for heteroscedasticity using the Breush-Pagan test, which assessed whether error variances were equal across the IDoR score spectrum, the p value of the result was greater than 0.05 (p=0.80), indicating that the variance of the residuals is constant and that heteroscedasticity is not present (Breusch and Pagan 1979).

Multicollinearity was checked by calculating the correlations between independent variables and using variance inflation factors (VIF) and generalised variance inflation factors ($GVIF^{1/(2*Df)}$). Correlations were calculated using Pearson's correlation coefficients (for two continuous variables), point biserial and polyserial correlation coefficients (for one continuous variable and one categorical variable) and Cramér's V (for two categorical variables), values <-0.6 or >0.6 would be indicative of multicollinearity. Correlation values ranged from -0.18 to 0.32 (Appendix 21).

Regarding VIF values, a commonly used rule of thumb is that a VIF value >10 indicates high multicollinearity (Myers 1990), while a VIF <5 is preferable for confirming that there is no collinearity (Buteikis 2019). The same VIF rules can be applied to the squared $GVIF^{1/(2*Df)}$ value (Fox and Monette 1992). Examination of VIF and $GVIF^{1/(2*Df)}$ values demonstrated no multicollinearity between the independent variables included in the final multiple regression model, with VIF values ranging between 1.027 and 1.693 and $GVIF^{1/(2*Df)}$ values ranging between 1.014 and 1.065 (Table 6-24).

Table 6-24: VIF and $GVIF^{1/(2*Df)}$ values for the IDoR regression model

VARIABLE	VIF	$GVIF^{1/(2*Df)}$
Gender: Female	1.135	1.065
Marital State:		1.031
Widowed	1.693	
Separated	1.347	
Single	1.240	
Optum SF-12v2 - PCS	1.049	1.024
Optum SF-12v2 - MCS	1.027	1.014
Number of days PoC is provided:		1.015
Other	1.056	
7	1.099	

6.6.3 Quantile Regression

Quantile regression analyses were carried out to investigate whether the influence of these factors across the IDoR distribution differed; the 20%, 30%, 40%, 50%, 60%, 70% and 80% (Q20-Q80) quantiles were used. Due to small sample sizes at extreme ends of the IDoR subscale distribution the 10% and 90% quantiles were not used, however, wide confidence intervals as a result of small sample sizes can still be observed at Q20 and Q80 for the variable PoC days: other. Regression coefficients for the independent variables, and their associations (with 95% confidence intervals), for both the OLS and quantile regression models are presented in Table 6-25.

Being separated (reference Married) was associated with a greater IDoR score at every quantile, however, this was only significant at Q60 and Q70. The association between being single and IDoR was found to be negative up to Q60, but reversed in the final two quantiles, however none of these associations were significant ($p>0.05$). Being widowed was consistently negatively associated with IDoR, however these associations were not significant at any quantile. Being female was positively associated with IDoR at each quantile, however, this was only significant at the 20% and 80% quantiles; the estimate was greater at the lower level (Q20). Having a PoC for any 'other' number of days (less than seven) had a positive association with IDoR at every quantile, however this was only significant at Q60. Conversely, receiving a PoC seven days a week was found to have an increasingly negative effect on IDoR as the quantiles increased; the association was significant in Q60, Q70 and Q80. Only the Optum SF-12v2 PCS and MCS scores were significantly associated with IDoR at every quantile. At each quantile, higher perceived health was associated with a higher IDoR subscale score.

VIF values were calculated at each quantile with values ranging between 1.0061 and 3.1349, suggesting that there were no issues with multicollinearity (Appendix 22) (Buteikis 2019).

Appendix 23 includes the quantile coefficients plots for the IDoR subscale, the red lines represent the OLS estimate and its confidence interval (the dashed lines). For most variables the plots show that the quantile slope estimates are not statistically different from the OLS estimate, as the quantile regression estimates lie within the OLS confidence intervals. These results therefore suggest that the OLS regression slopes are sufficient and there is no differential effect of these variables across the IDoR distribution. The exceptions to this are in Q30 for the variables 'marital state: single' and 'number of days a PoC is provided: other'.

Table 6-25: Comparison between the IDoR OLS and quantile regression models

	OLS β (95% CI)	QUANTILES (ESTIMATE (CI))						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
		'Lower IDoR score'			→		'Higher IDoR score'	
Intercept	16.99*** (12.38, 21.6)	11.74*** (7.90, 16.24)	12.85*** (8.54, 20.24)	14.20*** (6.29, 21.54)	13.83*** (6.01, 22.06)	16.29*** (8.73, 21.77)	17.90*** (10.67, 23.73)	21.14*** (14.28, 30.52)
Female (reference Male)	1.9** (0.46, 3.34)	2.99*** (1.14, 4.60)	1.63 (-0.34, 3.91)	2.08 (-0.1, 4.00)	2.06 (-0.28, 3.94)	2.08 (-0.05, 4.04)	2.17 (-0.04, 4.34)	2.41* (0.39, 4.57)
Marital state (reference Married)								
Widowed	-0.89 (-2.61, 0.84)	-1.19 (-3.03, 0.72)	-1.15 (-3.71, 0.90)	-1.22 (-3.08, 1.47)	-1.51 (-3.62, 1.4)	-1.11 (-3.73, 0.86)	-1.54 (-4.66, 2.15)	-1.46 (-4.57, 1.69)
Separated	2.86* (0.27, 5.45)	1.12 (-2.35, 5.26)	2.99 (-2.64, 6.81)	2.90 (-1.5, 7.44)	3.8 (-0.3, 7.23)	4.27** (0.36, 6.86)	2.56* (0.25, 6.49)	1.33 (-2.25, 7.04)
Single	0.32 (-2.71, 3.36)	-2.23 (-6.33, -0.03)	-2.79 (-5.4, 2.37)	-0.998 (-7.1, 3.43)	-1.46 (-7.23, 6.62)	-0.38 (-4.40, 6.8)	2.63 (-4.92, 10.67)	2.28 (-3.04, 10.19)
Optum SF-12v2 : PCS	0.31*** (0.24, 0.38)	0.31*** (0.23, 0.41)	0.33*** (0.20, 0.42)	0.30*** (0.26, 0.42)	0.34*** (0.22, 0.41)	0.33*** (0.24, 0.44)	0.35*** (0.21, 0.50)	0.35*** (0.26, 0.44)
Optum SF-12v2 : MCS	0.34*** (0.27, 0.41)	0.30*** (0.25, 0.38)	0.33*** (0.26, 0.40)	0.36*** (0.22, 0.46)	0.37*** (0.24, 0.48)	0.37*** (0.29, 0.47)	0.38*** (0.27, 0.48)	0.36*** (0.25, 0.49)
PoC days (reference Zero)								
other	3.68 (-0.39, 7.75)	3.65 ($-1.7e^{+308}$, 12.1)	8.48 (-9.77, 10.31)	6.32 (-2.32, 10.68)	4.78 (-0.77, 10.18)	4.46* (1.28, 11.98)	4.65 (-0.36, 10.25)	3.17 (-0.78, $1.8e^{+308}$)
seven	-2.10** (-3.47, -0.73)	-1.19 (-2.96, 0.45)	-1.19 (-3.05, 0.07)	-1.39 (-3.45, 0.51)	-1.35 (-3.63, 0.17)	-2.18* (-3.70, -0.003)	-2.29* (-4.93, -0.07)	-2.84* (-5.45, -0.75)

** p <0.1; ** p<0.01; ***p<0.001*

6.6.4 The Protective and Vulnerability Factors of Environmental Determinants of Resilience

6.6.4.1 Ordinary Least Square Regression

Following the approach described previously, a series of regression models were produced to assess the associations between the independent variables and EDoR. The results of the univariable stage can be seen in Appendix 24. Variables significantly associated ($p<0.1$) with EDoR in the univariable stage, and that assessed similar domains were entered in a series of multivariate linear regression models (Table 6-26).

Table 6-26: Regression estimates between independent variables and EDoR

VARIABLE	REGRESSION ESTIMATES		
	CRUDE	ADJUSTED†	ADJUSTED⁎
FIRST LEVEL			
Intercept	-	25.66 *** (25.00, 26.31)	-
Religion (reference Christian)			
Atheist	-1.92 *** (-2.94, -0.9)	-1.92 *** (-2.94, -0.9)	-
Other	0.79 (-1.65, 3.22)	0.79 (-1.65, 3.22)	
SECOND LEVEL			
Intercept	-	29.73 *** (26.79, 32.68)	30.74 *** (27.97, 33.52)
CFS score (reference Managing well)			
Vulnerable	-2.3 (-5.35, 0.76)	-2.23 (-5.27, 0.80)	-2.48 (-5.46, 0.50)
Mildly Frail	-3.89* (-6.82, -0.95)	-3.49* (-6.42, -0.57)	-3.66 * (-6.51, -0.8)
Moderately Frail	-5.91*** (-8.8, -3.02)	-5.58*** (-8.48, -2.68)	-5.68 *** (-8.5, -2.87)
Severely Frail	-6.11*** (-9.34, -2.88)	-6.26*** (-9.48, -3.04)	-6.22 *** (-9.36, -3.09)
Admitted following a fall (reference No)			
Yes	-0.97 * (-1.97, 0.026)	-0.63 (-1.84, 0.58)	-

Admitted with shortness of breath (reference No)			
Yes	1.4 * (0.03, 2.79)	1.15 (-0.22, 2.53)	-
Diagnosed as having a fall (reference No)			
Yes	-1.08 * (-2.25, 0.09)	-0.18 (-1.58, 1.23)	-
Diagnosed with a condition of the circulatory system (reference No)			
Yes	1.29 * (0.1, 2.47)	1.06 * (-0.08, 2.19)	1.07 * (-0.06, 2.19)
Diagnosed with a condition of the digestive system (reference No)			
Yes	-0.84 * (-1.84, 0.16)	-1.61 * (-3.15, -0.06)	-1.27 * (-2.76, 0.23)
Past medical history of digestive condition (reference No)			
Yes	-0.84 * (-1.84, 0.16)	-0.82 (-1.85, 0.21)	-
Past medical history of eye condition (reference No)			
Yes	-1.58 ** (-2.75, -0.42)	-1.08* (-2.26, 0.10)	-1.43 * (-2.55, -0.31)
Past medical history of mental health condition (reference No)			
Yes	-1.36 * (-2.66, -0.07)	-1.26 * (-2.57, 0.07)	-1.15 * (-2.36, 0.07)
Number of past medical health conditions	-0.3 * (-0.62, 0.018)	0.12 (-0.25, 0.50)	-
THIRD LEVEL			
Intercept	-	27.28 *** (26.22, 28.35)	30.83 *** (28.06, 33.59)
Barthel Index - bathing (reference Independent)			
Dependent	-2.9 *** (-3.89, -1.92)	-2.84 ** (-4.54, -1.14)	-0.74 (-2.13, 0.64)
Barthel Index - bladder (reference Continent)			-

Occasional accident	0.04 *	0.76	
	(-1.35, 1.43)	(-1.73, 0.97)	
Incontinent	-1.21	-0.38	
	(-2.42, 0.009)	(-1.73, 0.97)	
Barthel Index - grooming (reference Independent)			-
Dependent	-1.88 ***	-0.25	
	(-2.92, -0.84)	(-1.64, 1.14)	
Barthel Index - dressing (reference Independent)			
Requires some help	-2.27 ***	0.77	-
	(-3.28, -1.26)	(-1.01, 2.55)	
Dependent	-2.22 *	1.76	
	(-4.17, -0.26)	(-1.52, 5.04)	
Barthel Index - feeding (reference Independent)			-
Requires help	-1.9 *	-1.15	
	(-4.03, 0.23)	(-3.98, 1.08)	
Barthel Index - stairs (reference Independent)			
Requires help	-1.49 *	-0.93	-0.32
	(-2.89, -0.09)	(-2.34, 0.47)	(-1.68, 1.04)
Unable	-2.27 ***	-1.19 *	-0.48
	(-3.49, -1.05)	(-2.52, 0.13)	(-1.78, 0.82)
Barthel Index - toilet use (reference Independent)			
Requires some help	-2.1 **	-0.13	-
	(-3.54, -0.66)	(-1.86, 1.59)	
Dependent	-0.96	0.81	
	(-3.22, 1.3)	(-2.99, 4.61)	
Barthel Index - transfer (reference Independent)			
Minor help	-3.64 ***	-2.62 *	-2.46 *
	(-5.67, -1.6)	(-4.82, -0.41)	(-4.48, -0.44)
Major help or Unable	-0.55	0.58	1.07
	(-2.79, 1.7)	(-2.7, 3.85)	(-1.61, 3.76)
FOURTH LEVEL			
Intercept	-	9.02 ***	14.55 ***
		(6.13, 11.91)	(10.36, 18.74)
Optum SF-12v2 - PCS	0.21 ***	0.22 ***	0.18 ***
	(0.16, 0.26)	(0.17, 0.27)	(0.13, 0.23)
Optum SF-12v2 - MCS	0.17 ***	0.18 ***	0.17 ***
	(0.12, 0.23)	(0.14, 0.23)	(0.12, 0.22)

FIFTH LEVEL			
Intercept	-	26.39 *** (25.52, 27.25)	-
Care package before admission (reference No)			-
Yes	-1.48 ** (-2.46, -0.5)	-0.35 (-1.75, 1.06)	
Care package on discharge (reference No)			-
Yes	-2.07 *** (-3.09, -1.05)	-2.71 (-6.68, 1.26)	
Care package onset (reference No PoC)			-
On discharge	-2.18 *** (-3.25, -1.1)	2.05 (-3.03, 7.13)	
After time-lapse	-1.83 * (-3.94, 0.28)	0.4 (-3.54, 4.34)	
After intermediate care	-0.58 (-3.86, 2.69)	2.48 (-2.79, 7.76)	
Days of PoC provision (reference 0)			-
7	-2.25 *** (-3.27, -1.22)	-1.42 (-4.42, 1.57)	
Other	1.51 (-1.59, 4.6)	2.42 (-1.7, 6.55)	

† Adjusted for variables in the level; ⊀ Adjusted for precedent levels
** p <0.1; ** p<0.01; ***p<0.001*

Finally all variables that were still associated with EDoR (p<0.1), after being adjusted for variables within their level and the levels preceding them, were entered into a fully adjusted model. As before, hypothesised interaction terms were added, however as they were not significant after inclusion they were dropped from the final model (Table 6-27). Variables with a p value >0.05 were also dropped from the final model.

Table 6-27: Adjusted EDoR regression model with interaction terms added

	FULLY ADJUSTED MODEL		FULLY ADJUSTED MODEL WITH INTERACTION TERMS	
VARIABLE	**REGRESSION ESTIMATE (CI)**	**P VALUE**	**REGRESSION ESTIMATE (CI)**	**P VALUE**
Intercept	14.55 (10.36, 18.74)	$3.31e^{-11}$	10.41 (-7.96, 28.78)	0.27
Religion (reference Christian)				
Atheist	-1.8 (-2.67, -0.92)	$6.16e^{-5}$	-1.86 (-2.74, -0.97)	$4.63e^{-5}$
Other	1.05 (-1.07, 3.18)	0.33	1.07 (-1.14, 3.27)	0.34
CFS score (reference Managing well)				
Vulnerable	-1.44 (-4.15, 1.27)	0.3	2.93 (-17.71, 23.58)	0.78
Mildly Frail	-2.17 (-4.8, 0.46)	0.11	1.81 (-17.5, 21.22)	0.85
Moderately Frail	-3.46 (-6.09, -0.83)	0.01	0.65 (-18.16, 19.46)	0.95
Severely Frail	-3.38 (-6.62, -0.14)	0.04	-2.53 (-22.99, 17.92)	0.81
Diagnosed with a condition of the circulatory system (reference No)	0.75 (-0.26, 1.77)	0.15	0.70 (-0.32, 1.73)	0.17
Diagnosed with a condition of the digestive system (reference No)	-1.1 (-2.44, 0.25)	0.11	-1.13 (-2.49, 0.22)	0.10
Past medical history of an eye condition (reference No)	-1.24 (-2.25, -0.23)	0.02	-1.25 (-2.27, -0.24)	0.02
Past medical history of mental health condition (reference No)	0.17 (-0.96, 1.30)	0.77	0.23 (-0.92, 1.37)	0.7
Optum SF-12v2 - PCS	0.18 (0.13, 0.23)	$7.2e^{-12}$	0.51 (0.03, 0.99)	0.04
Optum SF-12v2 - MCS	0.17 (0.12, 0.22)	$2.7e^{-11}$	-0.06 (-0.29, 0.17)	0.62
Barthel Index - transfer (reference Independent)				
Minor help	-1.55	0.1	-1.56	0.1

	(-3.37, 0.28)		(-3.40, 0.29)	
Major help or Unable	1.74 (-0.7, 4.17)	0.16	1.80 (-0.66, 4.27)	0.15
CFS score * SF-12v2 - PCS (reference Managing Well)				
Vulnerable			-0.37 (-0.88, 0.14)	0.15
Mildly Frail	-	-	-0.34 (-0.84, 0.16)	0.18
Moderately Frail			-0.33 (-0.82, 0.16)	0.19
Severely Frail			-0.3 (-0.81, 0.22)	0.26
CFS score * SF-12v2 - MCS (reference Managing Well)				
Vulnerable			0.25 (-0.02, 0.52)	0.07
Mildly Frail	-	-	0.24 (-0.02, 0.49)	0.07
Moderately Frail			0.23 (-0.02, 0.47)	0.07
Severely Frail			0.28 (-0.002, 0.56)	0.06
BIC	2453.82		2496.74	
AIC	2389.44		2400.17	
ADJUSTED R^2	0.31		0.3048	

6.6.4.2 Goodness of Fit

Regression diagnostic plots were used to investigate whether there were any influential observations, outliers, or leverage points.

In this model, observations nine, 33 and 138 had slightly larger Cook's distances than other data points, however the Residuals versus Leverage plot did not suggest that they were overly influential to the regression results as the Cook's distance lines were not visible (Figure 6-9). Consequently, the observations were retained in the analysis.

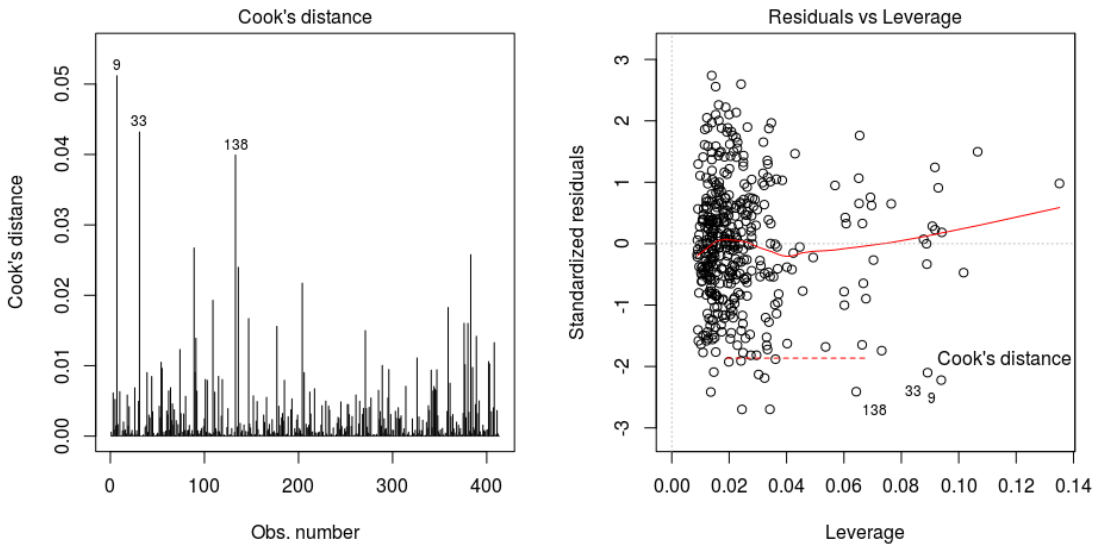

Figure 6-9: Cook's Distance plot and the Residuals vs Leverage plot for the EDoR regression model

Both the Residuals versus Fitted values and the Scale-Location plots (Figure 6-10) supported the assumption of homoscedasticity, with no patterns being seen in the residuals, which were also spread relatively evenly around the y=0 line in the plot of Residuals versus Fitted values.

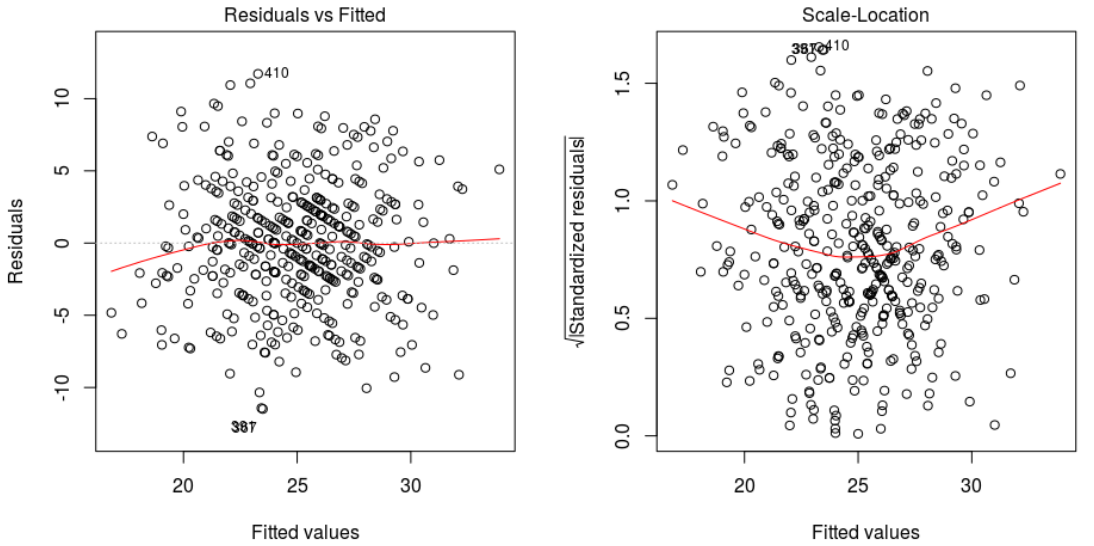

Figure 6-10: Residuals vs Fitted Values plot and the Scale-Location plot for the EDoR regression model

Residuals were also approximately normally distributed, with most observations sitting nicely along the 45-degree line in the QQ-plot (Figure 6-11).

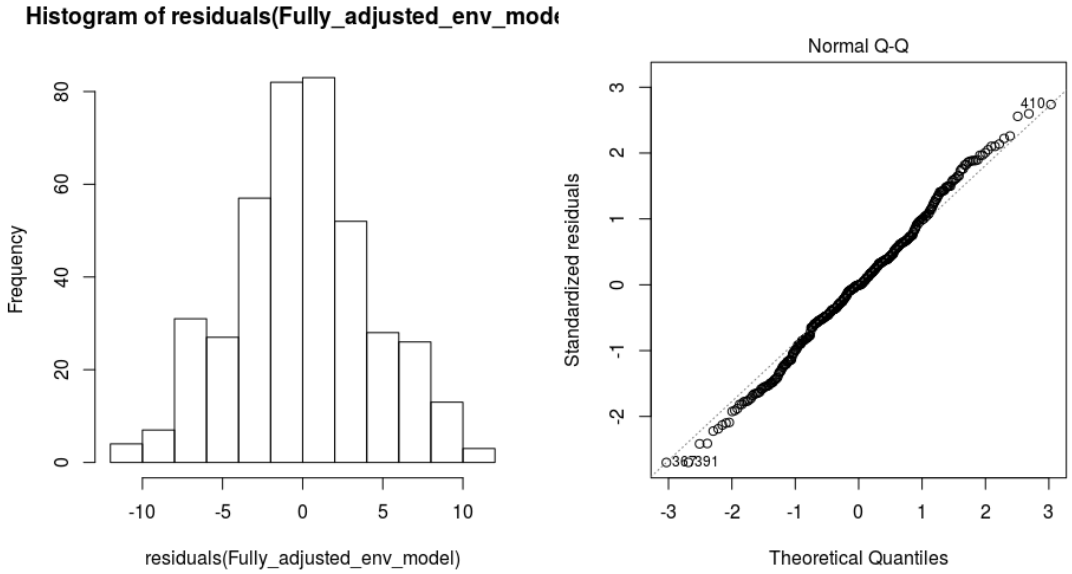

Figure 6-11: Histogram of residuals and QQ-Plot for the EDoR regression model

The final multiple regression model was used to compare the actual versus the predicted EDoR subscale scores for the few observations which deviated slightly from the line (Table 6-28). Some discrepancy was seen, and examination of other potential predictor variables revealed that these participants all lived in ground floor accommodation with access stairs, and were all admitted to hospital with an 'other illness' diagnosis.

These variables were added individually to the final multiple regression model, however, neither was significant in the final model (with p values >0.27) (Table 6-29). As a result, neither variable was included in the final model.

Table 6-28: Observations which deviate in QQ plot for the EDoR regression model

	367	**391**	**410**
Religion	Atheist	Christian	Atheist
CFS score	Moderately frail	Moderately frail	Moderately frail
Past medical history of an eye condition	No	No	No
Optum SF-12v2 - PCS	29.96	24.91	34.58
Optum SF-12v2 - MCS	49.6	61.28	47.94
Actual MiC Environment score	16	22	16
Predicted MiC Environment score	23	26	24

COMMONALITIES			
Admitted with 'other illness'	Yes	Yes	Yes
Accommodation type	Ground floor accommodation with access stairs	Ground floor accommodation with access stairs	Ground floor accommodation with access stairs

Table 6-29: P values of variables added to the EDoR regression model

VARIABLE	P VALUE
Accommodation type (reference Ground floor, no access stairs)	
Ground floor, access stairs	0.34
First floor, access stairs	0.48
First floor, lift access	0.63
Adm_other_ill (reference No)	0.27

Regression modelling was undertaken to explain the EDoR score of older adults receiving acute hospital inpatient care. The final regression model included the data from 408 participants as ten observations were removed due to missing data (five with missing SIMD data and five with unknown/non-substantive responses regarding religion).

A significant regression equation was found ($F(9, 403) = 20.58$, $p<2.26e^{-16}$), with an adjusted R^2 of 0.2995. Based on the OLS analysis results, the factors religion, frailty status (as measured by the CFS), perceived physical and mental health status (as measured by the Optum SF-12v2), and a past medical history of an eye condition explained 29.95% of the variance in EDoR score.

Participants' EDoR score is equal to 14.32 – 1.82 (religion: atheist) + 1.08 (religion: other) - 1.21 (past medical history of eye condition) – 1.54 (vulnerable) – 2.24 (mildly frail) – 3.55 (moderately frail) – 2.95 (severely frail) + 0.19 (Optum SF-12v2: PCS score) + 0.17 (Optum SF-12v2: MCS score); where all categorical variables are coded 0 = no, 1 = yes (Table 6-30).

Significant results demonstrated that participants' EDoR score decreased by 1.82 if they were atheist (reference Christian), by 1.21 if they had a past medical diagnosis of an eye condition, and by up to 3.55 depending on their frailty score (reference Managing well). Conversely,

participants' EDoR score increased by 0.19 and 0.17 for each unit increase in their Optum SF-12v2 PCS and MCS scores, respectively.

The Breush-Pagan test returned a p value greater than 0.05 (p=0.89), indicating that there were no issues with heteroscedasticity in the final model.

Table 6-30: Final adjusted EDoR regression model

VARIABLE	REGRESSION ESTIMATE	P VALUE
Intercept	14.32 (10.21, 18.43)	$2.81e^{-11}$
Religion (reference Christian)		
Atheist	-1.82 (-2.7, -0.94)	$5.31e^{-5}$
Other	1.08 (-1.03, 3.2)	0.32
CFS score (reference Managing well)		
Vulnerable	-1.54 (-4.26, 1.19)	0.27
Mildly Frail	-2.24 (-4.88, 0.41)	0.09
Moderately Frail	-3.55 (-6.19, -0.91)	0.009
Severely Frail	-2.95 (-5.94, 0.03)	0.05
Past medical history of an eye condition (reference No)	-1.21 (-2.22, -0.19)	0.02
Optum SF-12v2 - PCS	0.19 (0.14, 0.23)	$6.30e^{-13}$
Optum SF-12v2 - MCS	0.17 (0.12, 0.22)	$4.97e^{-12}$
BIC		2435.096
AIC		2390.94
ADJUSTED R^2		0.2995

Correlations between independent variables ranged from -0.08 to 0.14 (Appendix 25) and VIF values ranged from 1.017 to 9.956 (Table 6-31). The variables with VIF values >5 were dummy variables which represented the categorical variable 'CFS score'. However, the low VIF values of the other variables suggest that there is not an issue with multicollinearity in the model. Furthermore, the standard VIF treats each predictor separately. As a result, the predictors will have high VIF values if the proportion of cases in the reference category is small, regardless of whether it is associated with other variables in the regression model (Allison 2012). Alternatively, $GVIF^{1/(2*Df)}$ values provide a combined measure of collinearity for each group of predictors that should be considered together (Fox and Monette 1992). $GVIF^{1/(2*Df)}$ values demonstrated that there is no multicollinearity between the independent

variables included in the final multiple regression model, with values ranging between 1.008 and 1.091 (Table 6-31).

Table 6-31: VIFs and GVIF$^{1/(2*Df)}$ values for the EDoR regression model

VARIABLE	VIF	GVIF$^{1/(2*Df)}$
Religion:		1.015
Atheist	1.057	
Other	1.073	
Clinical Frailty Scale Score:		1.029
Vulnerable	5.232	
Mildly Frail	8.232	
Moderately Frail	9.956	
Severely Frail	4.075	
Past medical history of eye condition: Yes	1.054	1.027
Optum SF-12v2 - PCS	1.191	1.091
Optum SF-12v2 - MCS	1.017	1.008

6.6.5 Quantile Regression

Quantile regression analyses were carried out to investigate whether the association of these factors differed across the EDoR distribution. Again, the 20%, 30%, 40%, 50%, 60%, 70%, and 80% quantiles (Q20-Q80) were used. The regression coefficients for the independent variables, and their associations with 95% confidence intervals, for both the OLS and quantile regression are presented in Table 6-32.

Self-rated physical and mental health, as measured by the Optum SF-12v2 PCS and MCS scores, were the only variables significantly associated with EDoR at every quantile. At each quantile, higher perceived physical and mental health consistently predicted a higher EDoR score.

Being an atheist (reference Christian) was found to have a significant negative association with EDoR in all quantiles ($p<0.05$), with the effect being larger at lower quantiles. The association between identifying with a religion other than Christianity (reference Christian) and EDoR was found to be positive in every quantile, however only significant in Q70.

Regarding the CFS scores, at every quantile any level of frailty (reference Managing well) was found to have a negative association with EDoR, with most of the associations being

significant in Q50, Q60 and Q70. However, the large confidence intervals for the estimates at Q20 and Q80 (Table 6-32) suggest that the sample size was not sufficient to adequately power the regression at these quantiles.

Having a past medical history of an eye condition was also negatively associated with EDoR at every quantile, however, this was only significant at Q50.

VIF values ranged from 1.0196 and 71.8256 for each variable across the quantiles (Appendix 26). Again, CFS predictors had the highest VIF values due to the small number of cases in the reference group; this is more pronounced at the lowest and highest quantiles where regression coefficients were also affected by small sample size. Nevertheless, the VIF values for the other variables across the quantiles ranged between 1.0196 and 3.6568 suggesting that the CFS predictors were not associated with any other independent variable in the regression models and that multicollinearity is not an issue in any of the quantile regression models (Allison 2012).

Appendix 27 includes the quantile coefficients plots for the EDoR subscale. In the majority of the plots the quantile estimates lie within the OLS confidence intervals, suggesting that the OLS regression model is sufficient and that there is no differential effect of the variables across the EDoR distribution. The only exception to this is in Q20 for the variable 'Optum SF-12v2: PCS score'.

Table 6-32: Comparison between the EDoR OLS and quantile regression models

	OLS β (95% CI)	QUANTILES (ESTIMATE (CI))						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
		'Lower EDoR score'				→	'Higher EDoR score'	
Intercept	14.32*** (10.21, 18.43)	13.17 (-0.35, 16.36)	12.52*** (3.19, 16.54)	13.74*** (9.2, 17.09)	15.54*** (9.03, 18.87)	13.07*** (8.83, 21.66)	14.46*** (10.23, 20.77)	17.78*** (11.53, 22.62)
Religion (reference Christian)								
Atheist	-1.82*** (-2.7, -0.94)	-2.54*** (-3.63, -0.83)	-1.77*** (-3.00, -1.07)	-1.93*** (-2.72, -0.58)	-1.47*** (-2.06, -0.29)	-1.05* (-2.42, -0.15)	-1.27** (-2.21, -0.18)	-1.29* (-2.74, -0.13)
Other	1.08 (-1.03,3.2)	0.47 (-5.79, 3.19)	0.08 (-2.73, 4.67)	2.37 (-1.89, 4.21)	2.67 (-2.17, 3.77)	2.36 (-0.01, 4.05)	2.30 (0.81, 3.85)	0.83 (0.18, 5.99)
CFS score (reference Managing well)								
Vulnerable	-1.54 (-4.26, 1.19)	-4.08 (-6.17, $1.8e^{+308}$)	-1.65 (-4.86, 6.61)	-1.49 (-4.12, 7.75)	-1.39 (-4.45, 1.39)	-1.41 (-5.62, 0.71)	-1.88 (-5.86, 0.86)	-2.09 ($1.8e^{+308}$, 2.15)
Mildly frail	-2.24 (-4.88, 0.41)	-4.56 (-6.09, $1.8e^{+308}$)	-3.14 (-5.73, 5.05)	-3.6 (-5.86, 4.29)	-3.2** (-6.34, -0.76)	-3.53* (-7.78, -1.19)	-3.4** (-6.39, -0.56)	-3.27 ($1.8e^{+308}$, 0.58)
Moderately frail	-3.55*** (-6.19, -0.91)	-5.87 (-7.56, $1.8e^{+308}$)	-4.23 (-6.75, 3.83)	-4.82 (-7.16, 3.92)	-4.28*** (-7.36, -1.95)	-4.00** (-8.12, -1.91)	-4.41** (-8.11, -1.65)	-4.77 ($1.8e^{+308}$, -0.87)
Severely frail	-2.95* (-5.94, 0.03)	-5.46 (-9.66, 4.15)	-3.6 (-6.81, 4.42)	-4.37*** (-7.34, -2.45)	-4.29*** (-6.59, -1.21)	-3.35* (-6.67, 1.43)	-1.38 (-7.07, 2.1)	-2.28 (-4.96, 1.56)
Past medical history of an eye condition (reference No)	-1.21* (-2.22, -0.19)	-0.3 (-2.93, 0.84)	-0.64 (-1.72, 0.66)	-0.71 (-1.78, 0.09)	-1.17** (-1.74, -0.20)	-1.09 (-2.26, 0.02)	-1.05 (-2.32, -0.21)	-1.31 (-3.53, 0.57)
Optum SF-12v2 : PCS	0.19*** (0.14, 0.23)	0.14*** (0.1, 0.22)	0.19*** (0.09, 0.24)	0.16*** (0.13, 0.24)	0.17*** (0.13, 0.24)	0.20*** (0.12, 0.26)	0.21*** (0.15, 0.26)	0.21*** (0.15, 0.29)
Optum SF-12v2 : MCS	0.17*** (0.12, 0.22)	0.20*** (0.14, 0.27)	0.17*** (0.14, 0.25)	0.2*** (0.12, 0.24)	0.17*** (0.14, 0.25)	0.21*** (0.12, 0.25)	0.2*** (0.14, 0.26)	0.17*** (0.11, 0.25)

** p <0.1; ** p<0.01; ***p<0.001*

6.7 Determining whether there is a relationship between participants' self-rated resilience scores and frailty, and to investigate whether their self-efficacy has a mediating effect on the relationship.

In the univariable OLS models (Tables 6-19 and 6-26) being 'mildly frail' was found to be associated with EDoR while being 'moderately' or 'severely frail' was found to be associated with both IDoR and EDoR.

Mediation analyses were conducted to assess the effect of self-efficacy on the relationship between frailty and both IDoR and EDoR. Age, gender, religion, and marital status were included as confounding variables.

As no self-efficacy measure was completed by participants during data collection, the IDoR subscale items which formed the self-efficacy factor were used as a self-efficacy measure. Accordingly, the IDoR subscale used during this stage of analysis did not include the self-efficacy factor items.

The mediation analysis calculated the total effect of each level of frailty on both the IDoR and EDoR subscales; the indirect effect of the frailty level on IDoR and EDoR through self-efficacy (the average causal mediation effect (ACME)) and the direct effect of the frailty level on IDoR and EDoR (the average direct effect (ADE)).

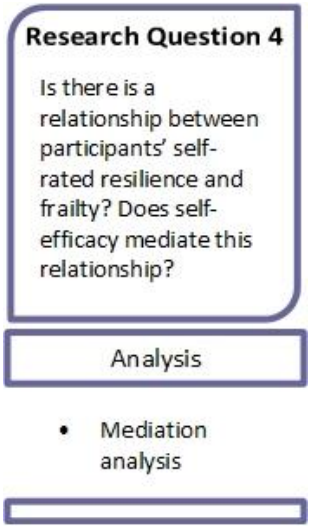

Figure 6-12: Analysis plan for research question four

6.7.1 Frailty, Self-efficacy and IDoR

After removing the self-efficacy items from the IDoR subscale the total effect of frailty on IDoR was not found to be significant (<0.05) at any level of frailty (reference Managing well) in the mediation analysis (Table 6-33).

Nevertheless, it is suggested that though the total effect is not significant, this does not prevent frailty from having an indirect effect on resilience through self-efficacy. This reasoning is based on the understanding that the total effect is the sum of many different paths of influence, not all of which will be covered by this mediation analysis (Hayes 2009).

These paths of influence can operate in opposite directions which could cause a total effect that is not significantly different from zero, though the mediation effects would be (Hayes 2009).

Accordingly, the results of this mediation suggest that as frailty increases the indirect effect of frailty on IDoR through self-efficacy increases, while the direct effect of frailty on IDoR decreases. In the final model, which uses 'severe frailty' as the independent variable, the negative effect of severe frailty on IDoR was entirely explained by the indirect mechanism through self-efficacy (Table 6-33).

Furthermore, in the final two models (Frailty levels: moderately frail and severely frail) the partial mediation of self-efficacy on the relationship between frailty and IDoR was statistically significant (p=0.01 and p<0.001, respectively).

Table 6-33: Mediation analysis of frailty on IDoR through self-efficacy

	DEPENDENT VARIABLE: IDoR†	
FRAILTY LEVEL (reference Managing well)	**ESTIMATE (CI)**	**P VALUE**
Vulnerable (n=59)		
ACME	0.31 (-1.47, 2.26)	0.77
ADE	1.2 (-1.56, 3.99)	0.39
Total Effect	1.51 (-1.80, 4.86)	0.39
Mildly Frail (n=121)		
ACME	-0.88 (-2.62, 1.01)	0.28
ADE	-0.15 (-2.72, 2.62)	0.89
Total Effect	-1.03 (-4.23, 2.31)	0.51
Moderately Frail (n=190)		
ACME	-2.19 (-4.2, -0.36)	0.01
ADE	-0.43 (-2.93, 2.42)	0.74
Total Effect	-2.63 (-5.8, 0.65)	0.092
Severely Frail (n=36)		
ACME	-4.84 (-7.07, -2.67)	<0.001
ADE	2.00 (-0.99, 5.21)	0.196
Total Effect	-2.84 (-6.66, 0.54)	0.088

ACME: Average causal mediation effect, ADE: Average direct effect
† Does not include items used for self-efficacy measure

In the univariable OLS models being moderately or severely frail was found to be associated with IDoR at p=0.079 and p=0.013, respectively. By removing the self-efficacy factor items

from the IDoR subscale these total effects were reduced. This also suggests that the effect of frailty on self-efficacy contributes to the effect of frailty on IDoR.

6.7.2 Frailty, Self-efficacy and EDoR

In the second mediation analysis the total effect of frailty on EDoR was significant (<0.05) at every level of frailty (reference Managing well) (Table 6-34).

In the first model, which uses 'vulnerable to frailty' as the independent variable, the results suggested that self-efficacy lessens the negative effect of this frailty level on EDoR, though this result was not statistically significant (p=0.76).

The results of the other models suggest that as frailty increases the indirect effect of frailty on EDoR through self-efficacy increases, while the direct effect of frailty on EDoR decreases (Table 6-34). This partial mediation of self-efficacy on the relationship between frailty and EDoR becomes statistically significant in the final two models (Frailty levels: moderately frail and severely frail).

Table 6-34: Mediation analysis of frailty on EDoR through self-efficacy

	DEPENDENT VARIABLE: EDoR	
FRAILTY LEVEL (reference Managing well)	**ESTIMATE (CI)**	**P VALUE**
Vulnerable (n=59)		
ACME	0.26 (-1.57, 2.02)	0.76
ADE	-3.21 (-5.4, -0.91)	0.012
Total Effect	-2.95 (-5.8, -0.27)	0.032
Mildly Frail (n=121)		
ACME	-0.82 (-2.57, 1.07)	0.38
ADE	-3.43 (-5.47, -1.29)	<0.001
Total Effect	-4.25 (-7.08, -1.50)	0.004
Moderately Frail (n=190)		
ACME	-2.17 (-3.96, -0.42)	0.004
ADE	-4.24 (-6.45, -1.74)	<0.001
Total Effect	-6.4 (-9.29, -3.57)	<0.001
Severely Frail (n=36)		
ACME	-4.65 (-6.57, -2.70)	<0.001
ADE	-2.11 (-4.79, 0.44)	0.12
Total Effect	-6.76 (-9.90, -3.80)	<0.001

ACME: Average causal mediation effect, ADE: Average direct effect

6.8 Conclusion

Following the use of the MiC questionnaire in three MoE wards, analysis was undertaken to assess the underlying structure and validity of the questionnaire; to identify the resilience needs, protective factors, and vulnerability factors of the population, particularly for those who scored at the lower end of the IDoR and EDoR spectrums; and to investigate whether self-efficacy mediates the relationship between frailty and both IDoR and EDoR.

Exploratory factor analysis was conducted on the two subscales of the MiC questionnaire. The IDoR subscale was found to consist of six factors, while the EDoR subscale consisted of five. These factors were found to have acceptable discriminant validity, and TLI values greater than 0.9; furthermore, they had theoretically interpretable factors. Item analysis also supported the conclusion that the MiC questionnaire reliably measured the IDoR and EDoR of the participants, with satisfactory item difficulty and item discrimination values and Cronbach α values >0.7, confirming internal consistency within the subscales.

It was identified that the three most common resilience needs of the sample were self-efficacy, person-environment fit, and friends. Further analysis found that receiving a care package, increasing frailty, and lower perceived physical health was associated with greater need in these three areas. Poorer physical functioning and lower perceived mental health were also found to be related to poorer self-efficacy and person-environment fit.

Regression analysis found that participants who were female, were separated, and had better Optum SF-12v2 PCS and MCS scores had greater IDoR scores, while participants who received a PoC seven days a week had lower IDoR scores. Quantile regression found that the effect of being single on IDoR changed at Q70 from being negatively associated to being positively associated. Additionally, quantile regression found that the negative effect of receiving a daily PoC was more pronounced in participants with higher IDoR scores.

Participants' EDoR score also increased when their Optum SF-12v2 PCS and MCS scores were higher. However, participants who were atheists (reference Christian), had a medical diagnosis of an eye condition, or were moderately or severely frail had a lower EDoR score. Quantile regression with the EDoR subscale suggested that the negative association of being an atheist may be more pronounced with those with lower EDoR scores, however it also largely suggested that the OLS regression slope is sufficient for predicting EDoR score.

Finally, mediation analysis was conducted to determine whether self-efficacy mediated the relationship between frailty and both IDoR and EDoR. The results of the mediation analyses suggested that as frailty increases the indirect effect of frailty on both the IDoR (minus the self-efficacy factor items) and EDoR through self-efficacy increases, while the direct effect of frailty on IDoR and EDoR decreases.

A summary of the research questions, statistical methods, and key findings can be seen in Figure 6-13. The following chapter explores the findings from this study in the context of current literature.

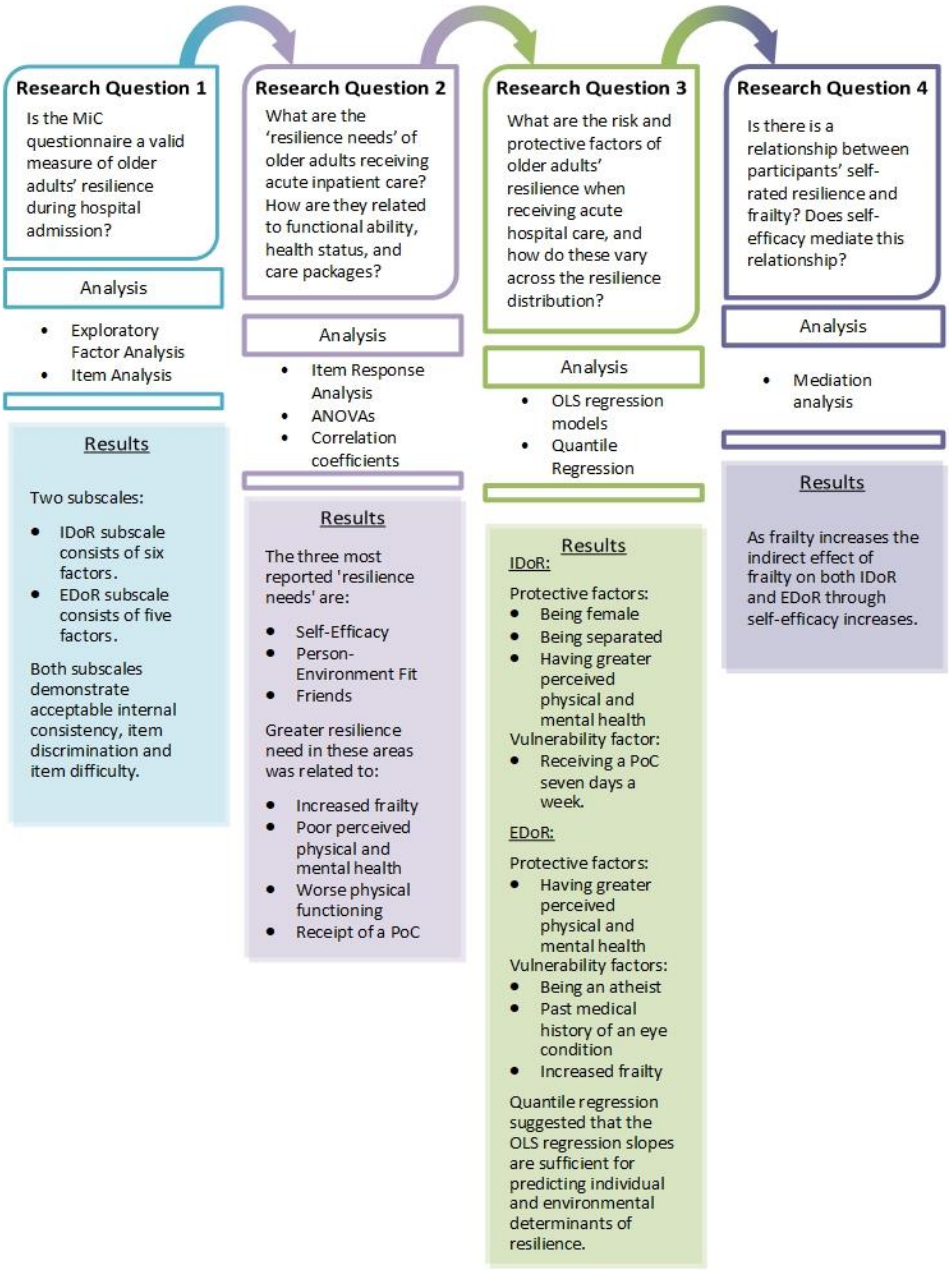

Figure 6-13: Summary of research questions, statistical analysis techniques, and key findings

Chapter 7 Discussion

7.1 Introduction

Resilience is a complex construct that is currently a priority within healthcare research and practice as it is believed that through developing the understanding of older adults' resilience there is the potential to improve their health and quality of life, as well as reduce healthcare expenditure (Esche and Tanner 2005; Hicks and Conner 2014; Martin 2016). In view of this, researchers and clinicians are increasingly using resilience measures to develop and improve clinical evidence-based practice. However, the majority of resilience measures focus on individual factors influencing older adults' resilience, and geriatric resilience research has largely recruited community-dwelling individuals (Windle et al. 2011; Cosco et al. 2016). The contextual nature of resilience means that assessments focused on the individual determinants of resilience alone are of little conceptual relevance, and that resilience research findings from community-dwelling older adults should not be generalised to older adults receiving acute geriatric hospital care (Vanderbilt-Adriance and Shaw 2008). Consequently, multidimensional resilience assessments conducted with hospitalised older adults would allow for greater understanding of their resilience.

The current study used data collected from 418 older adults who were receiving care in an acute MoE ward at the RIE over a 13-month period. Exploratory factor analysis, item analysis, and item response analysis were used to establish the validity of the MiC questionnaire and to identify the most prevalent resilience needs of the sample. Various stages of regression analysis were then used to identify the protective and vulnerability factors of older adults, and to determine whether self-efficacy mediated the relationship between frailty and resilience. The purpose of the study was to answer the following questions:

- Is the Making it CLEAR questionnaire a valid measure of older adults' resilience during hospital admission?
- What are the specific 'resilience needs' of older adults receiving acute inpatient care? How are they related to functional ability, health status and care packages?
- What are the protective and vulnerability factors associated with the resilience of older adults receiving acute hospital care, and how do these vary across the resilience distribution?

- Is there a relationship between participants' self-rated resilience scores and frailty? Does self-efficacy mediate this relationship?

The purpose of the following chapter is to discuss findings from the current study within the context of existing research investigating older adults' resilience. Section 7.2 discusses the sample characteristics in the context of existing research. Section 7.3 focuses on the EFA and item analysis of the MiC questionnaire and discusses the items and factors within the context of current conceptualisations of resilience. Section 7.4 discusses the resilience needs of the population, while Section 7.5 focuses on the identified protective and vulnerability factors. Finally, Section 7.6 discusses the findings of the mediation analysis conducted between frailty, self-efficacy, and both IDoR and EDoR, before concluding with a summary in Section 7.7.

7.2 Nature of the sample

In order to ensure the quality and relevance of the current study, the focus was on collecting a representative sample of older adults admitted to three MoE wards. The use of the MiC questionnaire with a clinical sample also reflects the intended use of the assessment. Over the course of 13 months, 421 participants were recruited for the original study, this equated to 72.1% of eligible individuals (Appendix 3); data from 418 participants were included in this study.

In keeping with NHS guidance, and the Scottish Census, which broadly recognise 'older adults' as being those aged 65+ (Scotland's Census 2011; NHS England 2020a; NHS England 2020b), participants were required to be aged 65 or older. At 85.36 years, the mean age of the participants was considerably higher; however this is comparable to research studying similar MoE inpatient population groups in the UK (e.g. Jasinarachchi et al. 2009; Sabbaghi et al. 2018; Shenkin et al. 2019). This likely reflects the process by which individuals are deemed appropriate for specialist geriatric care, as it is increasingly being based on frailty level rather than chronological age (Adhivaman 2017; RCP 2020).

In total 67.5% of the older adults in the study sample were female. The sample therefore has a higher ratio of females to males than can be seen in the general Scottish population of older adults (aged 65+), of whom approximately 57% are female, and the general population of

older adults in Edinburgh, of whom approximately 58.5% are female (Scotland's Census 2011). However, female majority samples are similarly evident in existing research studies with older adult populations receiving acute hospital care (e.g. Sabbaghi et al. 2018; Shenkin et al. 2019). It is suggested that this is due to women having a higher life expectancy than men, making them more likely to spend more years in poorer health with greater need for healthcare services (The Scottish Public Health Observatory 2019). Furthermore, Sabbaghi et al. (2018) found that patients aged 65+ who were admitted to a MoE ward were more likely to be female than individuals aged 65+ who received care on another medical ward.

Regarding other demographic variables, a far larger percentage of the sample were widowed (64.6%) when compared to the general population of older adults in both Scotland and Edinburgh (40.08% and 38.54% respectively), while fewer were married (20.8% in the sample, compared to 40.95% in Scotland and 37.8% in Edinburgh) (Scotland's Census 2011). Few published studies have reported the marital status of similar populations. However, Jasinarachchi et al.'s (2009) also recruited participants from MoE wards, 76.6% of whom lived alone, suggesting that their participants may not have had significantly different marital characteristics. Furthermore, social support is associated with better physical health (McClain et al. 2018) and better quality of life (Li et al. 2015), while good family functioning is associated with better physical and mental well-being (Lu et al. 2017); this may explain why widowed older adults and older adults living alone are more likely to be admitted to hospital.

Belonging to a religious group also provides a greater level of social support for older adults as they provide a network of close friendships to turn to in times of crisis, this may contribute to a reduced use of healthcare services (Ong et al. 2014). Accordingly, while 72.12% of the older population in Edinburgh describe themselves as being a Christian, a far smaller proportion of this study's sample did (55.3%). Instead, a much larger population of the sample stated they were not religious (39.2%) when compared to the older adult population of Edinburgh (18.27%) (Scotland's Census 2011).

Concerning ethnicity, 99.4% of the sample described themselves as being 'white'. While this may limit the generalisability of the results to populations of ethnic minorities, the sample is representative of the older adult population in Scotland, 99.17% of whom are 'white', and in Edinburgh, where 98.44% of older adults are 'white'.

Finally, regarding health status, 44.3% of the sample were scored as being 'moderately frail' by the CFS. This is in keeping with the results of Sabbaghi et al. (2018) who also used the CFS

and found that the mean CFS score for an individual admitted to a MoE ward was 6.1 (1.0), corresponding with the rating 'moderately frail'.

The recruited sample partially reflects characteristics of the broader Scottish population, with the differences between the sample and the available prevalence statistics likely reflecting the recruitment of a clinical sample. This suggestion is supported by the close similarity observed between the current study's sample and the participants of other research which recruited older adults from MoE wards. Moreover, the clinical nature of the sample is a particular strength of this study, as it represents the population the MiC questionnaire is intended to assess.

The following sections discuss the findings of the statistical analysis in this study.

7.3 Quality of the Making it CLEAR questionnaire

Taken as a whole, the MiC questionnaire reflects current conceptualisations of resilience as being affected by both individual and environmental factors (Windle et al. 2011). However, the MiC questionnaire was designed to measure the individual and environmental determinants of resilience across two subscales. For this reason, statistical analysis was conducted with each subscale separately. Similarly, future use of the MiC questionnaire should consider IDoR and EDoR subscale scores separately, as combining them would compromise the quality of the measurement.

To assess the construct validity of these two subscales, EFA was carried out to ensure that the factors measured were well defined and conceptually coherent. Item analysis assessed the quality of the items included in each subscale.

7.3.1 Quality of the individual determinants of resilience subscale

7.3.1.1 Exploratory factor analysis of the IDoR subscale

The IDoR subscale of the MiC questionnaire consists of 21 items, EFA of the subscale extracted six factors which were labelled 'self-efficacy' (five items), 'values' (six items'), 'interpersonal skills' (three items), 'life orientation' (three items), 'self-care ability' (two items), and 'process skills' (two items). The six factors were theoretically interpretable and

reasonably coherent, with no factors containing items with disparate themes, and no items having salient cross-loadings. Furthermore, factor intercorrelation varied between 0.19-0.63, suggesting that each factor assesses a unique dimension of IDoR and highlighting no issues with discriminant validity of the factors.

The items suggest an ability to negotiate, adapt to, and manage adversities; consequently, endorsement of these items reflects this ability. Comparing the results of this study with existing research offers preliminary support for the construct validity of the MiC questionnaire, as the factors reflect characteristics which have been found to be present in resilient individuals. The primary factor of the IDoR subscale is self-efficacy; self-efficacy is conceptualised as one of the core components of resilience, and is found to be a key characteristic of resilient individuals in many studies (e.g. Hardy et al. 2004; Martin et al. 2015a; Frietag and Schmidt 2016). The extraction of a prominent self-efficacy factor is particularly important, as the lack of one is recognised as a limitation in other resilience measures (such as the 10-item CD-RISC (Campbell-Sills and Stein 2007)).

With regards to the other factors extracted from the IDoR subscale, the factor 'interpersonal skills' is supported by literature that has found communication skills (Martin et al. 2015a) and family functioning (Lu et al. 2017) to be protective factors; the factor 'self-care ability' is supported by studies which found independence in ADL and self-care to be protective factors (e.g. Hardy et al. 2004; Torma et al. 2013; Bolton et al. 2016); and the factor ' process skills' is supported by literature which presents cognitive functioning as an important protective factor for older adults' resilience (Lamond et al. 2008; MacLeod et al. 2016).

Interestingly, the items which measured positive psychological resources, which are broadly recognised as protective factors of older adults' resilience, and include resources such as happiness, hope, and a sense of meaning (e.g. Bolton et al. 2016; MacLeod et al. 2016; Fullen et al. 2018; Polson et al. 2018) fell under the two factors titled 'values' and 'life orientation'. It is suggested that the 'values' items assess characteristics more closely related to an individual's personality (e.g. whether they are patient, forgiving, happy, optimistic, and whether they have a sense of humour), while the 'life orientation' items measure an individual's general sense of their life and its purpose in the context of previous life experiences, current principles, and expectations of the future. This is in keeping with life orientation measures used in gerontological research (e.g. Fagerström 2010; Tilvis et al. 2012; Eloranta et al. 2015). Furthermore, in life orientation measures 'feeling needed' and

'loneliness' are also recognised as important aspects (Fagerström 2010); this may explain why the item 'I am happy to help my friends and family' partially loaded onto the 'life orientation' factor, though not significantly. Existing research has also suggested that positive life orientation is closely linked to resilience (Eloranta et al. 2015), further supporting the extraction of this factor.

In view of this, the results of the EFA suggest that the IDoR subscale measures a characteristic that differentiates between older adults whose IDoR enable them to adapt well following adversity, thus supporting resilience, and those whose do not. Furthermore the correlations between IDoR and frailty, and IDoR and perceived physical and mental health, echo the findings of resilience research which has found comparable relationships between resilience and similar variables (e.g. physical health: Hildon et al. (2008), MacLeod et al. (2016), Jeste et al. (2019); mental health: Lamond et al. (2008), Torma et al. (2013), Liddell and Ferreira (2019); perceived health: Hardy et al. (2004)).

It is important to note, however, that this analysis was cross-sectional, and therefore other causal relationships could explain the observed pattern of results. For example, participants' current symptoms or circumstances could impact their response (e.g. participants who are feeling worried about discharge arrangements might perceive their abilities more negatively). Further tests of the validity of the MiC questionnaire are needed, and longitudinal tests that assess the ability of the MiC questionnaire to predict positive and negative outcomes would be particularly useful.

Additionally, while it is believed that the IDoR subscale assesses the primary individual factors which influence older adults' resilience, based on its concordance with current conceptualisations of resilience, the results of the EFA indicated that three items did not load onto any factor by greater than 0.4, while two factors were defined by just two items (see Table 6-4).

The original decision to require a factor loading of 0.4 was based on the guidance of Stevens (2002). However, in the same article Stevens states that a factor loading greater than 0.298 should be considered a significant factor loading when there are 300 or more observations, while other articles have suggested that items with factor loadings greater than 0.32 are significant (Tabachnick and Fidell 2007). Therefore, rather than removing these items based on their factor loadings, sensitivity analysis was carried out to determine how the removal of any of these items would affect the quality of the IDoR subscale. As described in Section 6.4.3,

removal of any one, or combination, of these items negatively affected the goodness-of-fit statistics of the EFA, did not improve the fit of other items on the factors, and resulted in factor solutions which yielded parameter estimates outwith the permissible range (a factor loading >1). Additionally, removal of any of these items would result in theoretically important information being lost, as each item taps into a unique quality of a resilient individual, specifically their sense of humour (Earvolino-Ramirez 2007), hope (Polson et al. 2018), optimism for the future (Lee et al. 2008; Martin et al. 2015a; Martin et al. 2015b), and their adaptability and ability to solve problems when they arise (Earvolino-Ramirez 2007). As such, the three items were retained in the subscale.

Removal of the item 'I can always think of ways to solve my problems' would also have resulted in the 'process skills' factor consisting of only one item. This would have caused the factor to have low reliability and may have resulted in it not being replicable across samples. It could be argued that this critique still applies to the factors 'self-care ability' and 'process skills' which consist of only two items, as it is suggested that factors should ideally be represented by at least three variables (MacCallum et al. 1996). One solution to this may have been to reduce the number of factors extracted in the EFA. However, it is also advised that factors should be retained if they allow for meaningful interpretation (Worthington and Whittaker 2006). In this analysis it was demonstrated that a five-factor solution would have too few factors. Furthermore, the six-factor solution resulted in theoretically interpretable factors, whereas a five-factor solution would have resulted in factors containing items with disparate themes, reducing the interpretability of results (an observation made of the CD-RISC by Campbell-Sills and Stein (2007)). For these reasons, the original six-factor structure was retained, though there is not a great depth of measurement within each factor. Accordingly, the MiC questionnaire should be used to measure broadly across the factors, to provide a rapid assessment of the respondent's IDoR, and as a tool to determine areas that warrant further investigation.

7.3.1.2 Item analysis of the IDoR subscale

Assessments use Likert scales to demonstrate an increase or decrease in the construct of interest, in this case resilience (Streiner 2008). The IDoR subscale of the MiC questionnaire is made up of 21 Likert-type scales, which measure patient responses on a scale from zero: 'strongly disagree' to three: 'strongly agree', representing a spectrum of agreement. Accordingly, each category progressively represents stronger IDoR than the category below

(Streiner 2008). The MiC questionnaire structure therefore echoes that of similar assessments, as this approach to measuring resilience is evident in existing research, which has used rating scale assessments to measure older adults' resilience (e.g. Connor and Davidson 2003; Smith et al. 2008).

As the basis of an assessment's measurement qualities, ensuring the quality of the Likert scales is crucial. For this reason, corrected item-total correlations, item difficulty values, and Cronbach's α were calculated to assess item discrimination, item difficulty, and the internal consistency of the subscale, respectively. For the IDoR subscale the item-total correlation and item difficulty values were acceptable, demonstrating that the items are effective in discriminating between individuals with low and high IDoR subscale scores (Masters 1988). Furthermore, the Cronbach's α value, together with the results of the EFA, suggests that the subscale is a reliable and consistent measure of one multidimensional construct.

Coupled with the results of the EFA for the subscale, these results indicate that the IDoR subscale is a valid and reliable brief measure of the individual determinants of older adults' resilience, though it could be improved by increasing the number of items which represent the 'self-care ability' and 'process skills' factors.

7.3.2 Quality of the environmental determinants of resilience subscale

7.3.2.1 Exploratory factor analysis of the EDoR subscale

The EDoR of the MiC questionnaire consists of 13 items, EFA of the subscale extracted five factors which were labelled 'person-environment fit' (six items), 'friends' (two items), 'material assets' (two items), 'habits' (two items), and 'family' (one item).

As with the IDoR subscale, the EFA of the EDoR subscale produced theoretically interpretable factors, which measured unique dimensions of EDoR. In addition, no items had salient cross-loadings, and all the items of the EDoR subscale loaded onto a factor with a factor loading >0.4. However, three of the five factors consist of only two items, while the family factor consists of only one item.

Again, a potential solution to this would be to reduce the number of factors extracted from the subscale. However, factor intercorrelations demonstrated that the factors had acceptable discriminant validity, and therefore, that the factors were measuring unique

dimensions. Accordingly, reducing the number of factors would have resulted in factors containing items with distinct and varied themes, reducing the interpretability of results.

Another solution would be to add more items which represent these factors. In an ideal world, researchers and clinicians would have sufficient time and resources to use well-established multi-item assessments which demonstrate superior content validity and reliability (Gosling et al. 2003). Unfortunately, in acute clinical care clinicians may be faced with a stark choice of using a brief measure or using no measure at all. The EDoR subscale of the MiC questionnaire consists of only 13 items and, consistent with other brief assessment tools, demonstrates somewhat diminished psychometric properties (e.g. Gosling et al. 2003). However, its brevity makes it appropriate for clinical care.

The inclusion of an EDoR subscale is also a strength of the MiC questionnaire, as it is recognised that previous resilience measures often overlook the role of environmental factors in determining an individual's resilience (Windle et al. 2011), even though the influence of situational and social factors on resilience is likely to be increased in advanced age (Hayman et al. 2017).

Unfortunately, the lack of previous resilience measures which assess EDoR makes it difficult to compare the items and factors of this subscale with those of another resilience measure. Nevertheless, the factors identified do broadly reflect environmental factors that have been found to relate to older adults' resilience in existing literature.

For example, the factor 'person-environment fit' is supported by research that has found that community involvement (MacLeod et al. 2016), 'places for growing older' (Wiles et al. 2012), perceived social resources (Nakashima and Canda 2005; Martin et al. 2015a), and availability of healthcare services (Wiles et al. 2012) are protective factors of older adults' resilience. Similarly the factor 'material assets' is supported by research that has found that income and perceived economic resources are protective factors of older adults' resilience (Hardy et al. 2004; Torma et al. 2013; Martin et al. 2015a; Martin et al. 2015b).

Regarding the factor 'habits', the associated items asked participants whether they found their routine, and their ability to organise it, satisfactory (items 8 and 9, see Appendix 1). Given the wording of these items, it is suggested that this is in keeping with existing research which found that resilience is associated with single Likert-type items that ask individuals 'All

things considered, how satisfied are you with your life as a whole these days?' (Fullen et al. 2018; Liddell and Ferreira 2019).

Existing research has also found that close friendships, neighbours, and families are protective factors of older adults' resilience (Wells 2010; Wiles et al. 2012; McKibbin et al. 2016). Importantly, findings of previous research also distinguish between support from friends and family, thus corresponding with the 'friends' and 'family' items loading onto separate factors in this study. Qualitative research has suggested that older adults view social support from friends as being the most consistent (Wiles et al. 2012), while quantitative research has found that social support provided by friends and by family can have independent effects on older adults' resilience, based on the characteristics of the population (e.g. Wells 2009; Wells 2010; McKibbin et al. 2016); for example a strong network of close friends may be more of a protective factor in widowed elders.

7.3.2.2 Item analysis of the EDoR subscale

As with the IDoR subscale, corrected item-total correlations, item difficulty values, and Cronbach's α were calculated to assess item discrimination, item difficulty, and internal consistency. Largely the results of these analyses demonstrated that the items are effective in discriminating individuals with low and high EDoR subscale scores, and the subscale was found to reliably measure one multidimensional construct. However, the item 'I have family who support me' was found to slightly reduce the Cronbach's α value, and only demonstrated moderate item discrimination. Moreover, this item was the sole item in the family factor.

The decision to retain the sole item on the family factor was both theoretical and statistical. With regard to resilience theory, family support is a recognised protective factor of older adults' resilience (Wells 2010; Wiles et al. 2012; McKibbin et al. 2016), and is understood to differ in its association with the resilience of older men and the resilience of older women, with the resilience of older women being more greatly influenced by the availability of social support from family members (Phillips et al. 2016). Moreover, family support is understood to have a unique role on resilience when compared to social support from friends (Fiori et al. 2006; Gouveia et al. 2016); this is demonstrated by the EFA which found that the items concerning friends formed a distinct factor. With regards to the statistical implications of removing the item, sensitivity analysis found that this would result in item parameter estimates outwith the permissible range (factor loading >1), and would only result in a minor improvement in the Cronbach's α value (by 0.001).

Nevertheless, the results of this analysis suggest that the EDoR subscale of the MiC questionnaire may be improved if the 'family' factor was represented by an increased number of items. Considering this, the EDoR subscale demonstrates little depth of measurement within each factor, consistent with the IDoR subscale. With three factors consisting of only two items, and one factor including only one item, these results suggest again that the MiC questionnaire should be used to broadly assess older adults' IDoR and EDoR, in order to identify areas that may benefit from further attention.

7.3.3 Benefits of using exploratory factor analysis in the current study

Exploratory factor analysis, an example of classical test theory (CTT), was selected instead of Rasch analysis, an example of item response theory (IRT), as the analysis approach in this study for three main reasons.

Firstly, methods of analysis based on CTT have traditionally evaluated the reliability, validity, and consistency of whole tests (Magno 2009). This includes the assessment of construct validity, which uses methods such as EFA or CFA, to evaluate the dimensionality of a measure and ensure that the dimensions adequately reflect the construct of interest (Petrillo et al. 2015). In comparison, IRT is focused on individual performance on a questionnaire, and how it relates to individual items; consequently, IRT is more appropriate for test construction (Lutz and Embretson 2015). As the MiC questionnaire was previously developed in partnership with older adults, the aim of this study was to assess whether the MiC questionnaire measured the resilience of older adults in line with current conceptualisations of resilience. Therefore, EFA was chosen as the appropriate statistical method and, within the context of the current study, usefully demonstrated the distinct factors in the IDoR and EDoR subscales. Interpretation of these factors corresponded with current conceptualisations of older adults' resilience, and thus confirmed the construct validity of the MiC questionnaire. Furthermore, the combination of these factors allowed for in-depth investigation of the protective and vulnerability factors of older adults' resilience, and allowed for detailed investigation of the role of self-efficacy on the relationship between frailty and resilience.

Secondly, IRT, and therefore Rasch analysis, stipulates that items should exist on a single latent trait to demonstrate true measurement (Kean et al. 2018). Given the multidimensional nature of previous resilience assessments and the design of the MiC questionnaire, the MiC questionnaire was not expected to meet this underlying assumption of the Rasch model. EFA

was therefore better suited to this analysis as it enabled the researcher to assess the multiple dimensions of the IDoR and EDoR subscales to ensure they adequately reflected current conceptualisations of resilience.

Thirdly, it is advised that Rasch analysis requires a sample size of greater than 1000 participants to obtain accurate item-parameter estimates (Hambleton 1989; Mokkink et al. 2019). Given that 418 participants were recruited for this study over a 13-month period, a sample size of 1000 participants would not have been achievable. In comparison, EFA requires a sample size with five to ten participants for each variable (Comrey and Lee 1992). For the EFA of the IDoR subscale this meant that at least 210 participants were required, while for the EDoR subscale 130 participants were required; though it is advised that EFA should be conducted with at least 300 participants, as larger sample sizes diminish the error present in the data (Yong and Pearce 2013). Therefore, using EFA in this study ensured that the analysis was adequately powered.

Some limitations of CTT are presented in current literature. CTT is often critiqued for being dependent on the sample recruited, consequently the results cannot be broadly applied across populations (Hambelton 2000), while Rasch models eliminate references to sample populations in test analysis (Rasch 1960). Nevertheless, this critique is not pertinent when samples are reasonably representative (Magno 2009). In Section 7.2, it was discussed that the population recruited for this study is largely representative of older adults receiving acute hospital care, based on descriptors from census data and previous studies which recruited older adults from acute medical wards. Therefore, the use of the MiC questionnaire in future research or practice with older adults receiving care in a MoE ward is supported by this study; though undertaking CFA to verify the factor structure of the MiC questionnaire would be recommended if it was to be used with a different older adult population.

Finally, it has been argued that Rasch analysis is more appropriate for ordinal rating scales, as it converts ordinal scale responses to interval level data, while CTT (and therefore EFA) creates errors in analysis as it assumes interval level data. However, this is disputed by studies which have concluded that CTT and IRT do not produce significantly different results when assessing test quality (e.g. Stage 2003; Petrillo et al. 2015). Furthermore, the IRT transformation from raw scores to logits may complicate the clinical use of scores (Kean et al. 2018).

7.4 Resilience needs

The second objective of this research was to identify the specific resilience needs of older adults receiving acute inpatient care, and investigate how they are related to functional ability, health status, and care packages. It was proposed that the identification of resilience needs may provide insight into potentially important focuses of intervention. Three main resilience needs were identified by the study, which related to participants' self-efficacy, person-environment fit, and friendships.

7.4.1 Self-efficacy

Item response analysis revealed that the primary resilience need reported by older adults during hospital admission was poor self-efficacy. This was in accordance with the items 'I always have enough energy to do the things I need and want to', 'I am physically able to do the things I need and want to do', and 'I see myself as a healthy person' receiving a negative response from 40%-55% of the participants. The prevalence of these negative responses is not unexpected, given the results of the systematic review and meta-analysis presented in chapter four, which found that older adults receiving acute hospital care were likely to have the lowest self-efficacy when compared to populations of older adults receiving other forms of healthcare provision.

In this study lower self-efficacy was found to be related to greater difficulty in performing ADL, increased frailty, and receipt of a care package. Self-efficacy was also found to be positively correlated with perceived physical and mental health. Again, these results are supported by studies included in the systematic review, which found similar relationships between self-efficacy and performance of ADL (Easom 2003), physical functioning (Mystakidou et al. 2010a; Mystakidou et al. 2015), physical health-related QoL (Kostka and Jachimowicz 2010; Strupeit et al. 2013; Haugland et al. 2016), and mental health-related QoL (Bonsaksen et al. 2014a; Magklara and Morrison 2015); though of these only the studies by Mystakidou et al. (2010a) and Strupeit et al. (2013) recruited older adults receiving inpatient hospital care.

Self-efficacy is predictive of adhering to treatment, making health modifications, being proactive in seeking health information, and engaging in self-care behaviours (Rodin 1986; Easom 2003; Kostka and Jachimowicz 2010; Stadtander et al. 2015). Given this, improving

the resilience of hospital inpatients through interventions targeting self-efficacy may also improve cooperation with treatment and engagement in therapies. In turn, these may result in the improvement of quality indicators in MoE wards such as improving patient experience by successfully supporting them to self-manage health conditions, improving quality of life by enabling discharge to the patient's usual place of residence and improving physical function, and reducing the likelihood of negative outcomes following discharge, such as an emergency readmission (NHS England 2014).

It is proposed that self-efficacy in older adults is primarily bolstered through mastery experiences where success in a particular task builds self-belief in their own abilities (Bandura 1997; McAuley et al. 2006; Schwarzer and Warner 2013). This is recognised by the studies which have proposed that self-efficacy interventions should involve the active participation in activities of everyday life, and should focus on ensuring that these provide mastery experiences for older adults (Enkvist et al. 2012; Köhler et al. 2018). Therefore, occupational therapists may play a key role in improving older adults' resilience, through facilitating interventions which enable the older adult to experience mastery in occupations that are meaningful to them.

7.4.2 Person-environment fit

Person-environment fit was the second resilience need identified in this study, and reflected the generally poor response to the items 'I have additional roles in my community/society', which was rated negatively by 80% of participants, and 'I can take part in the leisure activities that I want', which was scored negatively by 44.3% of participants.

Person-environment fit was found to be positively correlated with perceived physical and mental health, while poorer PE fit was found to be associated with difficulty in performing ADL, increased frailty, and the receipt of a care package. However, the results of the analysis suggested that some level of home support may increase PE fit as, although participants who received care seven days a week had a lower PE fit score, those who received support less frequently had a greater score than those who received no care at all.

Existing research has also identified the relationship between resilience and PE fit, proposing that the term 'habitational resilience' denotes the connection between an individual's ability to adapt, and their ability to live effectively within their home environment (Stafford and

Gulwadi 2020). Enabling older adults to live effectively within their home environment is currently a priority of policy makers, who are increasingly promoting 'ageing in place' (WHO 2007) which refers to an older adult 'living in the community, with some level of independence, rather than in residential care' (Davey et al. 2004, p. 133). While ageing in place has to be the preference of the older adult themselves, it also requires acceptable PE fit, as this enables older adults to cope with and adjust to challenges, and helps to maintain psychological well-being and functional independence (Phillips et al. 2005; Lien et al. 2015).

In order to support ageing in place, a range of social work and community measures are often utilised to improve PE fit, such as ensuring older adults reside in appropriate housing, with the provision of required support and care services (Davey et al. 2004).

Within acute hospital care, it is suggested that occupational therapists are well suited to providing interventions which seek to improve PE fit prior to hospital discharge as occupational therapy models recognise that occupational performance is shaped by the interaction between person, environment, and occupation (Maclean et al. 2012), and that 'disability' can be associated with poor PE fit rather than the impairment itself (Law et al. 1996). Occupational therapists therefore aim to improve PE fit by modifying the environment or occupation to support functioning and facilitate independence (Letts et al. 1994; Lien et al. 2015). However, occupational therapy in acute care can often focus on self-care, with little time to address leisure and work needs (Griffin and McConnell 2001), while literature often emphasises the importance of making home modifications prior to hospital discharge (e.g. Iwarsson 2015; Lien et al. 2015).

In this study, the items which made up the PE fit factor were primarily related to occupations which largely take place outside of the home, such as having additional roles in the community, being able to take part in hobbies, being able to find and use learning and training resources, and being able to get around the community. Moreover, it was these items that were scored poorly most frequently within this factor, while the item 'I live in safe and suitable housing' fell under another factor. Consequently, the results of this study suggest that interventions which seek to improve resilience through improvement of PE fit should also consider how older adults' involvement in the community could be supported. From a policy perspective, these results suggest that in order to facilitate ageing in place policy makers and urban planners need to ensure that communities are accessible and do not 'create' disability, as well as considering the appropriateness of housing and the

availability of support needed within the home. Similar conclusions are made by Kemperman et al. (2019) who found that satisfaction with local amenities supports ageing in place.

Interestingly, this research also found that older adults who received a small PoC (on fewer than seven days a week) had a higher mean PE fit score than those who received no care at all. Given the frequency of the care provided it is likely that these participants received support with tasks such as cleaning, food shopping or more infrequent ADL such as bathing. Previous research has also found that receiving support in ADL may result in new assets, such as freeing up resources and new social connections, whilst also reducing adversities such as stress associated with day to day life management (Staudinger et al. 19993; Hayman et al. 2017). Consequently, it is suggested that increasing the availability of these forms of support may enable older adults to age in place more easily.

7.4.3 Friends

The third resilience need of this sample pertained to an individual's social environment, particularly regarding their friends; 37.3% of participants stated that they were not part of a circle of friends, and 37.6% stated that they did not have a circle of friends that would support them through life's demands.

In older age, an individual's social groups tend to be smaller. This reduction can generally be explained by the death of friends and health problems which prevent older adults from being able to socialise with one another (Gouveia et al. 2016). This is supported by the findings of this research, as this resilience need was associated with increased frailty, inability to bathe and transfer independently, the receipt of a care package, and poorly perceived physical health. However, the receipt of acute hospital care also makes it more difficult for older adults to maintain social networks (HFMA 2019), which may decrease the confidence that patients have in their social network, particularly if they have experienced a long hospital stay and little contact with friends.

Lack of a close social network, or the ability to participate in one, can result in social isolation and loneliness which can lead to functional decline, mental ill health, and death (Singer 2018). As individuals age their health and well-being become increasingly dependent on close friendships, which provide social support, companionship, and reciprocity (Coelho and Duarte 2016; de Bruin et al. 2020). For this reason, it would be beneficial for MDTs in MoE

wards to consider how they could support patients to stay in touch with their social network. It is particularly important that engagement with friends is supported as, while family members may find it easier to visit relatives in hospital, networks of friends have been found to have a unique role in the well-being of older adults, and may have a greater influence on the quality of life of older adults than family networks (Fiori et al. 2006; Gouveia et al. 2016).

Furthermore, older adults' social network and feelings of isolation may be positively influenced by participation in physical activity and increased neighbourhood attachment (Bertera 2003; Kemperman et al. 2019). Therefore, MDT members, particularly occupational therapists and social workers, should consider how they can enable patients to participate in social occupations and their communities following discharge from hospital.

7.5 Protective and vulnerability factors of older adults' resilience

As the MiC questionnaire was validated as two separate subscales measuring the individual and environmental determinants of resilience, regression analysis was undertaken to identify characteristics associated with each subscale. The following sections integrate discussion about the characteristics found to be associated with IDoR and EDoR in this study, with the findings of previous research.

7.5.1 Individual determinants of resilience

Based on the OLS analysis results, the factors gender, marital state, perceived physical and mental health status (as measured by the Optum SF-12v2), and the number of days a care package is provided explained 30.98% of the variance in IDoR score (R^2 = 0.3098). This suggests that the model is moderately successful at predicting older adults' IDoR, based on the work of Ferguson (2009) who stated that an R^2 of 0.25 signifies a moderately successful model for prediction.

7.5.1.1 Gender

Previous studies investigating the relationship between resilience and gender have returned variable results. While some studies have found men to be more resilient than women in old age (e.g. Hardy et al. 2004; Demakakos et al. 2008), others have found women to be more

resilient (e.g. Netuveli et al. 2008; MacLeod et al. 2016; Phillips et al. 2016). In this study, women demonstrated a significantly higher IDoR score than men.

Resilience is bolstered when individuals can reflect on previous adversities and interpret them differently because of their successful adaptation and positive outcomes, thus preparing them to be resilient in the face of later adversities (Gulbrandsen and Walsh 2015). Resilience is also understood to be contextual (Dyer and McGuiness 1996; Earvolino-Ramirez 2007; Windle 2011), meaning that an individual can be resilient in one area of life but not another (Wiles et al. 2012). Given that women are likely to use healthcare services more frequently than men, due to spending a greater number of years in poorer health (The Scottish Public Health Observatory 2019), it is suggested that female participants may have demonstrated greater IDoR in this study due to having more opportunities to reflect on successful adaptation following previous hospital admissions or acute ill health. Previous research has similarly suggested that women have greater resilience due to multiple past adversities, though it recognises that these prior adversities may also relate to past caregiving concerns and societal and cultural changes, which also support them to face challenges later in life (Kinsel 2005).

In addition, greater social support is commonly found to improve older adults' resilience (e.g. Frietag and Schmidt 2016; MacLeod et al. 2016; Hayman et al. 2017), and Phillips et al. (2016) found that resilience in female older adults aligned with social engagement and social support from children, while resilience in male older adults was associated with social support from friends. Given that lack of social support from a friendship group was found to be one of the three main resilience needs in this population, and that women are more likely to have close social networks that they are able to reach out to in times of hardship (Falk-Kessler et al. 2012; MacLeod et al. 2016), the increased availability of social support for women may be another reason why women demonstrated greater IDoR than men in this study.

7.5.1.2 Marital state

Unlike social support, marital status is a factor which is not often investigated in resilience research with older adults. This may be due to the prevalence of widowhood in later life, which means that other family members, particularly adult children, become a more central source of support to older adults (Soulsby and Bennett 2015). However, on the whole

research demonstrates that marriage has a protective effect on psychological well-being (Schwarzbach et al. 2014).

Indeed, in this study widowers were found to have a lower IDoR score than married older adults; however, this relationship was not significant. Instead a significant difference in IDoR scores was found between older adults who were separated or divorced and older adults who were married, with separated older adults having a higher IDoR score. The contribution of one participant in Gulbrandsen and Walsh's (2015) qualitative study, who stated that their divorce strengthened their resilience, suggests that this observed relationship may be a result of developing resilience through previous adversity (in this case separation), thus preparing the individual to cope with adversity later in life. Moreover, a similar result was found in one reviewed quantitative study, which found divorcees and widowers had greater resilience than married older adults; however this study recruited community-dwelling older adults in Iran, and so had a considerably different study population (Izadi-Avanji et al. 2017).

7.5.1.3 Perceived health status

Existing research largely suggests that resilience in older age is associated with both perceived physical health and mental well-being, where better perceived health predicts higher resilience (Wagnild and Young 1993; Hardy et al. 2004; de Paula Couto et al. 2011; Gallacher et al. 2012; Gooding et al. 2012; Lau et al. 2018). In accordance with existing research, this study found that both perceived physical health and mental well-being were associated with IDoR.

It is suggested that there is a reciprocal relationship between these variables. While resilience preserves self-rated health through mediating the effect of a stressful event on older adults' well-being (de Paula Couto et al. 2011; Gallacher et al. 2012; Lau et al. 2018), better self-rated health results in older adults feeling that they are better equipped to cope with adversity, and prevent a sense of 'hopelessness' seen in older adults with worse self-rated health (Gooding et al. 2012). This is supported by the results discussed in Section 6.5.3.1, where lower perceived health was found to be associated with lower self-efficacy.

7.5.1.4 Package of care provision

No studies reviewed in this thesis have investigated the relationship between resilience and the receipt of a PoC. However, many have investigated the effect of independence in ADL, each finding that increased dependence is associated with lower resilience (Hardy et al. 2004; Hildon et al. 2008; Torma et al. 2013; Silverman et al. 2015; MacLeod et al. 2016). Lower

resilience has also been found to associate with worsened mobility and difficulty performing self-care activities (MacLeod et al. 2016; Bolton et al. 2016). Conversely, resilient individuals are reported to have almost twice as much engagement in independent leisure or domestic activities than vulnerable older adults (Hildon et al. 2008).

Given that packages of care are generally provided to support older adults who are unable to complete ADL independently, this existing research may explain why participants who received a PoC seven days a week were found to have a lower IDoR score than those who received no formal carer support. Quantile regression was also undertaken to investigate whether the influence of receiving a PoC varied across the IDoR score distribution. Receiving a PoC seven days a week was shown to have a more detrimental effect on the IDoR of older adults at the higher end of the score distribution.

Given the results of existing research, it is interesting that this study did not find limitations in specific ADL (as measured by the BI) to be associated with IDoR. This may suggest that the effect of functional limitations on resilience is cumulative, and that dysfunction in multiple ADL is needed to have a significant impact on older adults' resilience.

7.5.2 Environmental determinants of resilience

Based on the OLS analysis results, the factors religion, frailty status (as measured by the CFS), perceived physical and mental health status (as measured by the Optum SF-12v2), and a past medical history of an eye condition explained 29.95% (R^2 =0.2995) of the variance in EDoR score, suggesting that the model is moderately successful at predicting older adults' EDoR.

7.5.2.1 Religion

Spirituality and religion are protective factors frequently investigated in resilience research. In a population of older adults admitted to hospital, Faigin and Pargament (2011) found that over 40% of their participants spontaneously cited religion when asked an open-ended question regarding their coping resources. Liu et al. (2018) also investigated the relationship between religion and resilience in a population of hospitalised older adults. They found that the average resilience score of religious older adults was higher than that of the non-religious, though this difference was not significant.

Similarly, in this study participants who were Christian were found to have a higher EDoR score than those who stated they were atheists. Moreover, there was no significant

difference in the resilience score of participants who followed an 'other' religion from those who were Christians. In the quantile regression analysis stage, the negative effect of being an atheist on resilience was found to have a larger effect at the lower end of the EDoR score distribution.

Resilience theory suggests that religious beliefs provide a source of grounding in the face of adversity, a stable belief system which sustains an individual's attitude towards life, and a caring support network (Faigin and Pargament 2011; Wiles et al. 2012; Ong et al. 2014). In view of this, it is proposed that religion was associated with EDoR as being a member of a religious group enhances spiritual support systems (Faigin and Pargament 2011; Ong et al. 2014).

Members of religious groups tend to share similar beliefs, worldviews, and values, and are more likely to have increased opportunities to share in intimate moments and significant life experiences (Barrett 2013). Consequently, involvement in religious communities provides individuals with the opportunity and ability to develop and sustain long-term and meaningful relationships (Faigin and Pargament 2011; Barrett 2013). This is supported by studies which have found that being religious is associated with increased social support and social involvement, and lower levels of alienation (e.g. O'Brien 1982; Koenig et al. 1992; Lyons and Nivison-Smith 2006; Tarakeshwar et al. 2006; Ong et al. 2014). Moreover, it is suggested that the benefit of religious support is unique compared with the support offered by secular support networks (Faigin and Pargament 2011; Barrett 2013).

Nevertheless, individuals who access secular support networks (e.g., social clubs, activity groups, etc.) are still likely to benefit from meeting regularly with others (Faigin and Pargament 2011). Consequently, interventions that facilitate social connectedness, such as interest and activity groups, may be considered a key intervention in improving the EDoR of older adults (Gallacher et al. 2012).

7.5.2.2 Frailty and perceived health status

Echoing the results of the regression analysis with the IDoR subscale, perceived physical health and mental well-being were also found to be associated with EDoR in this study.

As EDoR are less frequently measured in research, this finding is novel. However, research has found that older adults with negative perceptions of ageing and with poor perceived health are less likely to participate in physical activity and more likely to demonstrate

reduced physical function (Machón et al. 2016; Breda and Watts 2017). Furthermore, older adults' physical function has been shown to associate with resilience during hospital admission (Rebagliati et al. 2016). Accordingly, it is suggested that older adults who perceive their health to be poor will have less interaction with their physical and social environment, thus reducing their environmental resources.

In addition, this study found that increased frailty was associated with poorer EDoR. This finding is supported by previous research, which has suggested that frailty and resilience are associated due to a reduced ability to adapt to physical, mental, and social adversities, resulting from increased vulnerability and poorer physical functioning (Freitag and Schmidt 2016; Gijzel et al. 2017). Accordingly, multiple studies have shown resilience to be significantly associated with frailty (Freitag and Schmidt 2016; Gijzel et al. 2017), including in a population of older adults admitted to hospital for orthopaedic surgery (Rebagliati et al. 2016).

7.5.2.3 Visual impairment

Age is a risk factor for many eye conditions such as macular degeneration, cataract, glaucoma, and diabetic retinopathy; consequently the majority of individuals with a visual impairment are over the age of 60 (RNIB 2013). Visual impairment can have negative implications upon well-being, quality of life, mental health, physical function, and social participation (Laforge et al. 1992; Thetford et al. 2015).

Previously, qualitative studies have suggested that visual impairment is also a vulnerability factor contributing to lower levels of resilience, yet does not prevent older adults from demonstrating high levels of resilience if they are able to utilise individual and environmental resources (Esche and Tanner 2005; Thetford et al. 2015). There is a lack, however, of quantitative studies that have investigated the association between resilience and visual impairment.

This study found that older adults who had a past medical diagnosis of an eye condition had a lower EDoR score than those who did not. It is suggested that this variable associated with EDoR as it was indicative of having difficulty in interacting with the physical and social environment. This is in accordance with Thetford et al.'s (2015) recommendation that visual impairment should be seen as an indicator rather than a mechanism of risk.

7.6 Frailty, self-efficacy, and resilience

As discussed in Section 2.3.4.3, the relationship between frailty and resilience is debated in current literature. While some authors position resilience as being the opposite of frailty (Hicks and Miller 2011), this is not supported by research which has provided evidence of resilience despite frailty (Holland et al. 2018; Whitson et al. 2018). Meanwhile, other authors suggest that resilience is a 'step beyond frailty' as it shifts focus away from a negative concept to a positive concept which refocuses attention on healthy ageing (Witham and Sayer 2015). A more common view is that resilience and frailty should be investigated together, as both recognise that an individual's response to adverse health conditions is dynamic and can vary significantly (De Alfieri et al. 2011; Rockwood and Mitnitiski 2015).

Recognising the debate concerning the relationship between resilience and frailty, this study sought to investigate their relationship further, hypothesising that self-efficacy would act as a mediator on the relationship. This hypothesis was drawn from McClain et al.'s (2018) research which found that older adults' self-efficacy directly predicted their resilience, while their physical health predicted their self-efficacy, as well as further existing research which has demonstrated associations between frailty and self-efficacy (Doba et al. 2016), and self-efficacy and resilience (Stadtlander et al. 2015).

Firstly, the association between frailty and both the IDoR and EDoR subscales was investigated using univariable regression analysis; the findings showed that frailty was related to both MiC questionnaire subscales, however, they did not explain all the variance in resilience scores (Appendices 20 and 24). These results support the previous research which has demonstrated that while resilience and frailty are associated with each other, they are not opposite ends of a spectrum.

In order to carry out the mediation analyses the items which made up the self-efficacy factor in the IDoR subscale were removed and used as a separate self-efficacy measure. The internal consistency of the self-efficacy factor was assessed using an inter-item correlation and deemed acceptable (Table 6-8), suggesting that the items included in the self-efficacy factor measure the same general construct. However, the creation of this self-efficacy measure also meant that the same items had to be removed from the IDoR subscale. This is a limitation of this analysis as removing items from the subscale changes the psychometric properties of the scale and may affect the validity of the scale (Wieland et al. 2017). However retaining the

items in the subscale would have inflated the relationship found between self-efficacy and the IDoR subscale, affecting the validity of the analysis.

Age, gender, religion, and marital status were included as confounding variables in the mediation analyses as gender and marital status were found to be associated with the IDoR subscale in the OLS regression analysis, while religion was found to be associated with the EDoR subscale. Furthermore, previous research has found relationships between age, gender and religion and either frailty or self-efficacy (e.g. Quinn et al. 1996; Buckinx et al. 2015; Stadtlander et al. 2015; Haugland et al. 2016; Cybulski et al. 2017).

The results of the mediation analyses found that as frailty increases the indirect effect of frailty on both IDoR (minus the self-efficacy items) and EDoR through self-efficacy increases, while the direct effect of frailty on IDoR and EDoR decreases. These findings support the existing literature that suggests frailty and resilience are associated with each other, and further suggests that self-efficacy should be considered within this relationship. In particular, this study supports the theory that interventions which target self-efficacy have the potential to improve patient health outcomes, as the findings of this research suggest that self-efficacy interventions may be effective in promoting the resilience of older adults with frailty in MoE wards. The results of this research also support multidisciplinary working within MoE wards as, while frailty tends to focus more on the physiological and functional traits of growing older, which lends itself to more biomedical professions, resilience lends itself to a range of other clinical professions, such as occupational therapists, social workers, and psychologists, given its focus on both the person and the environment.

7.7 Summary

The purpose of the preceding chapter was to discuss the findings of this study within the context of existing literature. The findings indicate that the MiC questionnaire is a valid and multidimensional measure of older adults' individual and environmental determinants of resilience, as both the IDoR and EDoR subscales demonstrate acceptable measurement qualities and construct validity. However, both subscales also had factors which consisted of less than three items and may reduce the replicability of the factor structure across samples. One way to improve the psychometric properties of the MiC questionnaire would be to reduce the number of factors in each subscale; however, the factors extracted were

theoretically interpretable and were therefore retained. Another solution would be to increase the number of items that measure each dimension, and by doing so increase the depth of measurement within each factor. However, the MiC questionnaire was designed to be a quick assessment of older adults' IDoR and EDoR, and its current brevity is appropriate for acute clinical settings. Consequently, it is proposed that its ability to be applied in the clinical care setting compensates for the somewhat diminished psychometric properties it displays as a consequence.

In addition to analysing the validity of the MiC questionnaire, this study also sought to identify the resilience needs of older adults receiving acute geriatric hospital care, as well as their protective and vulnerability factors. Findings from the research add to knowledge about the resilience of older adults experiencing acute illness.

Gender, marital state, perceived physical and mental health, and the number of days a care package is provided were found to be associated with IDoR, while the variables religion, frailty status, perceived physical and mental health status, and a past medical history of an eye condition were found to be associated with EDoR. These factors may enable the identification of older adults who would benefit from resilience interventions, either as a preventative measure in the community, or in acute settings to reduce the risk of adverse outcomes at discharge (e.g. hospital readmission).

Regarding the environmental determinants of older adults' resilience, the finding that religious older adults are likely to have greater EDoR scores may reflect the protective influence of being a member of a regularly-meeting social group which enables individuals to develop and sustain relationships with others (Faigin and Pargament 2011; Barrett 2013). Consequently, it is suggested that finding ways to encourage social connectedness may be an effective way of increasing resilience (Gallacher et al. 2012).

Resilience needs identified in the sample related to self-efficacy, PE fit and friends. This is consistent with the systematic review in Section 4.4, which found that the self-efficacy of older adults is lower in acute hospital settings than in other healthcare settings, as well as research which has demonstrated that having good PE fit and close friendships enable older adults to cope with adversities, and maintain psychological well-being and functional independence (Phillips et al. 2005; Lien et al. 2015; Singer 2018). Interventions targeting these three resilience needs may be effective ways of increasing older adults' resilience. In particular, the results of the mediation analysis suggest that self-efficacy interventions would

be an effective way of fostering resilience, especially as MoE wards tend to care for older adults with frailty.

Given that the self-efficacy of older adults is understood to be improved through mastery experiences, this research suggests that occupational therapists may play a key role as they seek to facilitate independence in ADL. Occupational therapists would also be well equipped to deliver interventions that seek to reduce the other resilience needs related to PE fit and friends; though these may require increased focus on occupations outwith the home environment which may be difficult to arrange in the acute hospital setting with its associated physical and time restrictions.

The following, final, chapter briefly summarises the content of this thesis in order to identify implications of this study for practice, policy, and research. In addition, the chapter outlines strengths and limitations of the current study, as well as directions for future work.

Chapter 8 Conclusion

Conceptualisations of resilience have seen significant changes over recent decades. In particular, the change from viewing resilience as a personality trait to a dynamic process is shaping healthcare research and practice today. When conceptualised as a dynamic process, resilience is understood to be modifiable and able to improve, thus allowing it to be a focus of intervention. Older adulthood is a unique period of life that brings about changes in health, habits, family dynamics, and social engagement. Resilience in older adults therefore warrants special attention, in order to ensure that it is supported.

Existing research demonstrates the association between older adults' resilience and a range of protective and vulnerability factors. Broadly, positive self-perceptions, psychological resources, and health behaviours, as well as good cognitive abilities, social support networks, and PE fit have been found to be protective factors, while mental health conditions, increased ill health, functional impairment, and a poor social support network increase older adults' vulnerability. However, resilience research with older adults has largely focused on the individual determinants of resilience, with less consideration being given to environmental influences. There are a growing number of resilience assessments available to measure resilience. However, few capture information about the environmental determinants of resilience. In contrast, the MiC questionnaire is designed to capture information about the individual and environmental determinants of older adults' resilience.

In addition, much of the existing resilience research focuses on older adults living in the community, with less focus on older adults experiencing acute ill health, disability, or institutionalisation. Generalisation of resilience research findings from one population of older adults to another is a cause for concern, given the contextual nature of resilience.

The purpose of the current study was to assess the validity of the MiC questionnaire with a population of older adults receiving inpatient care in a MoE ward, and to use the resulting data to further explore the resilience of older adults receiving acute medical care. Participants were recruited from three MoE wards at the RIE. Data were collected using a range of questionnaires following the provision of informed consent. Exploratory factor analysis, item analysis, and item response analysis were then undertaken to analyse the MiC questionnaire, and to identify the primary resilience needs of the sample. Several stages of

regression analysis were used to investigate the protective and vulnerability factors of older adults' IDoR and EDoR. Finally, mediation analysis investigated the effect of self-efficacy on the relationship between frailty and both IDoR and EDoR.

The study sample includes 418 older adults with a mean age of 85.36 years. The average length of hospital stay was 18.6 days, and each participant was discharged back to their original place of residence. Reflecting existing research and governmental statistics, the sample was largely female. Exploratory factor analysis demonstrated that the IDoR and EDoR subscales of the MiC questionnaire reflect current conceptualisations of older adults' resilience. However, based on the small number of items loading onto factors, the psychometric properties of the MiC questionnaire would be improved if more items were added to represent each factor.

The primary resilience need identified in this population was related to low self-efficacy. This reflects the results of the systematic review and meta-analysis presented in chapter four, which found that the self-efficacy of older adults receiving acute inpatient care is lower than that of older adults receiving other forms of healthcare provision. Poor PE fit and lack of social support from friends were also identified as significant resilience needs in the sample. This reflects existing literature which suggests that both PE fit and social support help to support well-being and enable older adults to age in place.

The regression analysis found that being female, separated, and having good perceived physical and mental health were protective factors of IDoR, while receiving a PoC seven days a week was a vulnerability factor. Being a Christian and having good perceived physical and mental health were found to be protective factors of EDoR, while increased frailty and an eye condition were vulnerability factors. Largely these results are supported by existing research investigating the resilience of older adults. However, the finding that Christians were more likely to have greater EDoR than atheists is particularly interesting, as it concurs with existing literature that found that being religious is associated with increased social support and social engagement. While religious support is understood to be unique compared with that offered by secular support networks, the facilitation of social connectedness (e.g. through activity groups) may therefore be an effective way of improving older adults' resilience.

Finally, the mediation analysis found that self-efficacy mediates the relationship between frailty and both IDoR and EDoR, and increasingly explains the association as frailty increases.

8.1 Strengths and unique contributions of the current study

There are three primary strengths of the current study which reflect its unique contribution to geriatric resilience literature.

Firstly, this study is one of the first and largest pieces of research available which has investigated the resilience of older adults receiving acute hospital care. Through the recruitment of a clinical sample, this research responds to the call for more resilience research with populations of older adults experiencing ill health and receiving inpatient care. In addition, the recruitment of a clinical sample enabled the MiC questionnaire to be validated using data from the population with which it is intended to be used. The sample was also found to be fairly representative of older adults receiving acute hospital care, based on governmental statistics and the demographic data from studies which recruited similar populations (Section 7.2), thus increasing the generalisability of this study's results.

Secondly, the exclusion of items assessing the environmental influences on resilience has been recognised as a major flaw of previous resilience measures. Through EFA this study confirmed the content validity of the MiC questionnaire as a holistic measure of the participants' resilience, assessing both individual and environmental determinants of resilience. Consequently, the current study supports the use of the MiC questionnaire in MoE wards, and its ability to identify priorities for hospital-based resilience interventions. Through the use of the MiC questionnaire in this study, the results also contribute to existing knowledge and conceptualisations of older adults' resilience, particularly given its findings regarding the protective and vulnerability factors associated with EDoR and the identification of PE fit and social support from friends as prominent resilience needs in this population.

Thirdly, the use of quantile regression techniques is a strength of this study. While quantile regression has gained popularity in other research disciplines, particularly econometrics, its use in healthcare research is relatively new. Quantile regression allows researchers to describe the effect of covariates at specific points on the distribution of a dependent variable. In healthcare research this allows researchers to examine how indicators of patients' health status change with patient characteristics; this can facilitate the creation of tailored response plans, adapted to the needs of those most vulnerable. In this study quantile regression was used to determine whether the effect of protective and vulnerability factors varied based on

whether an individual had high or low IDoR and EDoR; the quantile regression analysis largely confirmed the sufficiency of the multivariable OLS regression slopes.

8.2 Limitations of the current study

The study would have benefited from the inclusion of a specific self-efficacy measure, as the self-efficacy measure for the mediation analysis had to be extracted from the MiC questionnaire based on the results of the EFA. In addition, the inclusion of a second resilience questionnaire would have enabled the concurrent validity of the MiC questionnaire to be assessed. Both limitations relate to the secondary analysis of existing data carried out in this study. As the dataset analysed was collected for a different study with separate research questions the data collection design and measurement tools used were predetermined. However, secondary analysis of existing data enabled a large and representative sample to be collected, which, given the timeframe of a PhD, would not have been possible if primary data analysis had taken place. Furthermore, the involvement of the current researcher in the data collection, coding, and cleaning ensured a close familiarity with the data that is generally associated with primary data analysis, and is often lost when conducting secondary analysis.

This study drew strongly upon the understanding that unexpected deterioration in health and admission to hospital causes increased risk in older adults. However, it is likely that some of the participants would have also been facing additional stressors. Including a measure of cumulative adversities may have allowed the researcher to control for this. Moreover, the inclusion of a measure of previous adversities would also have been an interesting addition to the research, as the results of this study suggest that the experience of positive adaptation following previous adversities affects older adults' current resilience (e.g. separation).

Finally, this research was powered for the OLS regression analyses; in comparison quantile regression requires a much larger sample as it focuses on the extreme ends of the dependent variable's distribution, where fewer participants tend to score. Consequently, the quantile regression in this study was under-powered. This resulted in large confidence intervals at the 0.2 and 0.8 quantiles. Statistically speaking, one solution to this would be to uniformly sample individuals across the resilience distribution. However, in practice this would be very difficult as psychological and behavioural assessment measurements generally produce a normal distribution. While the results of the quantile regression suggest that the OLS regression

(which was adequately powered) slopes were sufficient, a larger study would need to be conducted to provide reliable quantile regression results.

8.3 Implications of the current study

8.3.1 Practice

In this thesis it has been suggested that there are two primary weaknesses of previous geriatric resilience research. Firstly, the resilience measures used have tended to assess resilience at an individual level only (Windle et al. 2011) and, secondly, the studies have primarily recruited community-dwelling older adults (Windle et al. 2010; Cosco et al. 2016). Both weaknesses limit the applicability of previous resilience research to clinical practice with older adults in acute hospitals given that resilience is understood to be context-dependent (Vanderbilt-Adriance and Shaw 2008), and the influence of environmental factors on resilience is likely to be increased in advanced age (Windle et al. 2011; Wild et al. 2013; Hayman et al. 2017).

In contrast, the current study recruited older adults receiving acute inpatient hospital care, a previously understudied population (Hardy et al. 2004; Windle et al. 2010), in order to validate a multidimensional measure of older adults' resilience, the MiC questionnaire, which contains items relating to both individual and environmental determinants of resilience.

The findings of the EFA demonstrate that the IDoR and EDoR subscales of the MiC questionnaire reflect current conceptualisations of older adults' resilience. While it was identified that the psychometric properties of the MiC questionnaire may be improved by the addition of more items, this would increase the length of the questionnaire which may reduce its applicability to clinical care settings. The current iteration of the MiC questionnaire is therefore recommended as a conceptually valid resilience tool, best suited as a quick assessment to broadly assess older adults' resilience and to identify areas that may benefit from further attention.

In addition to the validation of the MiC questionnaire, this study sought to identify the protective and vulnerability factors associated with the IDoR and EDoR of older adults receiving acute hospital care, and to identify the population's primary resilience needs.

Identification of these factors and resilience needs will help to direct clinical work and research focusing on improving older adults' resilience.

Largely, the protective and vulnerability factors associated with IDoR supported the findings of existing research. However, the factors associated with EDoR suggest new priorities for resilience interventions. Specifically, resilience interventions focused on improving environmental determinants should seek to improve social connectedness through community groups and consider how older adults who experience ill health and visual impairment can be supported to engage in these. In addition, this study identified that reduced self-efficacy, PE fit, and social support from friends were the primary resilience needs of the sample. Given the environmental nature of the latter two resilience needs, this study not only acknowledges the significant influence of the environment on older adults' resilience, but positions it at the centre of hospital-based interventions aimed at enhancing the resilience of older adults in order to maximise the potential for positive adaptation.

Finally, it has been proposed that occupational therapists may be in a unique position to provide interventions which improve the resilience of older adults during hospital admission. This conclusion is based on the understanding that the three primary resilience needs of the population would all be addressed by occupational therapy interventions. Through facilitating mastery experiences in occupations which are meaningful to the older adult, self-efficacy would be improved. Through modifying an individual's environment or the way in which they perform occupations, PE fit may be improved. Lastly, by focusing on an individual's ability to engage in social and community-based occupations, older adults may perceive an increased availability of social support from friends.

8.3.2 Policy

At a global policy level, documents such as the World Health Organisation's (2007) 'Guide to Global Age-Friendly Cities' advocate that older adults should be supported to age in place and live in the community with some level of independence. This is reflected at a national level within the NHS, as one desired NHS outcome is the development of age-friendly physical and social environments (NHS Scotland 2014). Given that PE fit was found to be the primary factor of the EDoR subscale, and was also one of the most prevalent resilience needs of the participants, findings of the presented research appear to have important implications for the development of ageing in place. By recognising the influence of an older adult's PE fit on

their ability to adapt well following ill health, and through the identification of factors which appear to influence this PE fit (Section 6.5.3.2), findings of the current study can contribute to further developments in this area. In addition, the MiC questionnaire could support future attempts to holistically measure and understand the resilience of older adults, and its impact on their ability to age in place. In turn, this may improve the identification of vulnerable older adults, which could serve as the basis for policy targeting.

Within the NHS, use of the MiC questionnaire and consideration of older adults' resilience during hospital care may support improvement in further NHS outcomes, including the optimisation of older adults' quality of life, well-being, and independence, together with NHS outcome measures, which include the recovery of functional ability, a reduction in length of stay, a reduction in emergency readmissions, the supporting of patients to self-manage conditions, and the discharge of patients to their usual place of residence (NHS England 2014; NHS Scotland 2014). This would also support the achievement of desired financial NHS outcomes, through reducing the cost of emergency readmissions and the cost of excess bed days.

8.3.3 Methodology

In pursuit of research findings which support the development of tailored response plans, this research utilised quantile regression methods to highlight the factors associated with the IDoR and EDoR of the 'least resilient' participants. As quantile regression is still a relatively novel statistical method in healthcare research, the use of it in this study demonstrates its value.

Quantile regression enabled the researcher to determine whether the effect of protective and vulnerability factors varied across the IDoR or EDoR score distribution, and therefore identify certain factors which were more (e.g. being an atheist on EDoR (reference Christian)), or less (e.g. receiving a PoC seven days a week on IDoR (reference No PoC)), influential for individuals with poorer subscale scores. Largely, however, the use of quantile regression in this study allowed the researcher to determine that the OLS regression slopes are sufficient for estimating the IDoR and EDoR of the population.

Regarding study design, the large confidence intervals observed at Q20 and Q80 in the quantile regression analysis of the EDoR subscale (Table 6-32) highlights the need for large

sample sizes to ensure adequate power; this should be considered when planning future healthcare research which intends to undertake quantile regression.

8.4 Directions for future work

8.4.1 The Making it CLEAR questionnaire

Exploratory factor analysis and item analysis in the current study indicated that the MiC questionnaire provides a valid and quick assessment of older adults' resilience. However, the data that was used in this study did not allow for other valuable validation tests to be carried out. Therefore, further research assessing the validity of the Making it CLEAR questionnaire would benefit from the inclusion of another resilience measure, so that the concurrent validity of the MiC questionnaire can be assessed, as well as the completion of the MiC questionnaire at two time points in order to assess re-test reliability.

Furthermore, as the EFA found that the MiC questionnaire subscales were multifactorial, with some factors consisting of only a few items, the reliability, factor structure, and construct validity of the MiC questionnaire with other populations of older adults cannot be determined based on this study. Therefore, to endorse the use of the MiC questionnaire with other populations of older adults, it must be established that the factor structure is stable across independent samples. Further development of the MiC questionnaire would therefore benefit from the recruitment of a different population of older adults.

Longitudinal research using the MiC questionnaire is also recommended. Through establishing the validity of the MiC questionnaire in predicting positive or negative outcomes during or following hospital admission (i.e. predictive validity), researchers would be able to determine an increase in score that is associated with better outcomes (Man-Song-Hing et al. 2002). This would further support the use of the MiC questionnaire in clinical practice.

8.4.2 Resilience interventions

While resilience theory suggests that resilience can be bolstered, there has been little work carried out which assesses the efficacy of interventions in improving older adults' resilience.

Inpatient hospital admissions give healthcare professionals a unique opportunity to intensively provide care to older adults. The current study adds to the existing knowledge base regarding the resilience needs of older adults, and highlights the important role of multidisciplinary teams in MoE wards. Subsequent longitudinal resilience research conducted in hospitals with older adult inpatients would enable the development and testing of resilience interventions. However, for this to provide strong evidence regarding the effectiveness of such interventions, researchers would also need to ascertain the change in older adults' resilience from admission to discharge when they are receiving 'normal care'. Consequently, single-blind randomised controlled trials are recommended as it may be difficult to blind researchers/care providers given their involvement in the provision of interventions.

8.4.3 Older adults' resilience

Older adults' resilience in hospital settings is a relatively under-researched area in comparison to community settings. Given the increased frailty and ill health of older adults receiving acute hospital care and the unique nature of acute hospital admission, the current study indicates that the resilience of older adults receiving acute hospital care may be different in comparison to a population of older adults living in the community. This conclusion is supported by the systematic review and meta-analysis presented in Section 4.4, which demonstrates that older adults receiving acute hospital care have significantly lower GSE than older adults residing in the community or receiving care in other healthcare settings. Consequently, further research investigating the process of resilience in older adults receiving hospital care is crucial.

In addition to recruitment of older adults receiving hospital care, this study was unique as it investigated the factors and resilience needs associated with the environmental determinants of older adults' resilience. If, as the current study suggests, the primary resilience needs of older adult inpatients are environmental in nature, it will be important to understand how addressing EDoR may enhance their resilience.

Given that existing geriatric resilience research has primarily investigated resilience at the individual level only, future research would also benefit from assessing the EDoR in different populations of older adults, to determine where their greatest resilience needs lie and how these can be improved.

Ultimately, fully understanding the complexity of older adults' resilience will benefit from assessing the interaction between contributory factors. Such work is likely to require the use of multidimensional resilience measures and a variety of study populations in order to ensure the collection of comprehensive and accurate information, useful for the development of clinical practice and policy.

8.4.4 Dissemination

Effective knowledge dissemination is crucial for increasing awareness of research and, therefore, maximising the impact that the research can have (Brigham Research Institute 2015). Vijayakumar and Vijayakumar (2007) argue that it is particularly important that the results of PhD studies are disseminated, given the requirement for them to make an original contribution to knowledge. In view of this, some learning generated as part of this research has already been shared through publication in an international, interdisciplinary, open-access, peer-reviewed journal (The Gerontologist, Impact Factor=3.286) (Whitehall et al. 2020, Appendix 2). This article reports the knowledge generated through the systematic review and meta-analysis presented in Section 4.4.

As part of the ongoing commitment to share research findings with the academic community as well as important stakeholders, the researcher aims to disseminate further learning generated by this study in a variety of ways.

Firstly, the researcher aims to publish findings in targeted, open-access, peer-reviewed, high impact journals. It is intended that the next publication will report the results of the EFA, before two further articles present the determinants of older adults' resilience during hospital admission and their resilience needs. Appendix 28 provides details regarding the working titles, target journals, and target audiences of these planned publications.

In addition, research findings will be shared through presentations at appropriate conferences (e.g. the Royal College of Occupational Therapy (RCOT) Annual Conference, given the implications for occupational therapy practice) and at other relevant knowledge-transfer events, and through feedback sessions with the funders of this PhD study and the clinical staff who supported data collection.

8.5 Summary

Resilience refers to the process of effectively negotiating, adapting to, or managing adversity; understanding the resilience of older adults during hospital admission has the potential to improve healthcare provision and patient outcomes.

The current study analysed data collected from older adults recruited during an acute hospital admission in a MoE ward. Data were collected using the MiC questionnaire, a resilience measure assessing both the individual and environmental determinants of resilience, as well as a collection of other sociodemographic and health-related questionnaires.

The study demonstrates that the MiC questionnaire provides a quick and valid assessment of older adults' individual and environmental determinants of resilience. It was also identified that the primary resilience needs of this population were related to self-efficacy, PE fit, and social support from friends. In addition, various protective and vulnerability factors were identified that associate with older adults' IDoR and EDoR. Finally, self-efficacy was found to mediate the relationship between frailty and both IDoR and EDoR.

Future work should address the concurrent and predictive validity of the MiC questionnaire, to further determine its clinical significance and support its future use. The findings of the study also emphasise the importance of assessing the environmental determinants of older adults' resilience, in order to provide a fuller and more holistic view of their resilience and to support the development of effective resilience interventions. When this knowledge is acquired the contribution of resilience to improving the quality of care in acute hospital wards, the quality of life in older adult inpatients, and its facilitation of ageing in place, may be seen more clearly in both policy and practice.

Chapter 9 References

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Chapter 10 Appendices

Appendix 1 - The Making it CLEAR questionnaire

	Strongly disagree	Disagree	Agree	Strongly Agree
A. I can always present myself in the way I want to (e.g. putting on my makeup, wearing a shirt and tie)	0	1	2	3
B. I have no problems taking care of the place where I live (e.g. vacuuming, changing bed sheets)	0	1	2	3
C. I can take part in the leisure activities that I want (e.g. sports, hobbies)	0	1	2	3
D. I can take part in the social activities that I want (e.g. meeting friends, family events)	0	1	2	3
E. I can find and use the community services I need (e.g. voluntary agencies, carer support, social work services)	0	1	2	3
F. I can find and use the learning/training resources that I want (e.g. library services, further education, interest groups)	0	1	2	3
1. I have additional roles in my community/ society (e.g. volunteer/unpaid work, member of an organisation)	0	1	2	3
2. I am part of a circle of friends (e.g. socially involved with friends, neighbours and/or support groups)	0	1	2	3
3. I have no problems getting around my home and neighbourhood (e.g. getting up and down stairs, reaching cupboards, getting to the shops)	0	1	2	3
4. I live in safe and suitable housing	0	1	2	3
5. My circle of friends helps me get through life's demands	0	1	2	3
6. I have family who support me	0	1	2	3
7. I can afford the things that I need	0	1	2	3

	Strongly disagree	Disagree	Agree	Strongly Agree
8. I am always satisfied with my daily routine	0	1	2	3
9. I have no problems organising my routine so that I can do the things that are important to me (e.g. making time to meet friends)	0	1	2	3
10. I am a patient person	0	1	2	3
11. I find it easy to accept whatever life throws at me	0	1	2	3
12. I can forgive myself and others	0	1	2	3
13. I have things to look forward to	0	1	2	3
14. I can see the funny side of life	0	1	2	3
15. I have principles that I live my life by	0	1	2	3
16. My past experiences have helped me learn about life	0	1	2	3
17. I am happy to help my friends and family	0	1	2	3
18. I am generally happy	0	1	2	3
19. I understand the realities of life	0	1	2	3
20. I see myself as a healthy person	0	1	2	3
21. I am able to do things on my own	0	1	2	3
22. I feel in control of my life	0	1	2	3
23. I am physically able to do the things I need and want to	0	1	2	3
24. I always have enough energy to do the things I need and want to	0	1	2	3
25. I can always make myself understood to others (e.g. over the phone, in new social situations)	0	1	2	3
26. I have no problems getting along with others and making new friends	0	1	2	3
27. I can always keep my mind on what I'm doing (e.g. planning a meal, doing a crossword)	0	1	2	3
28. I can always think of ways to solve my problems (e.g. reorganising appointments, retracing steps to find lost keys)	0	1	2	3

Appendix 2 - WHITEHALL, L., RUSH, R., GÓRSKA, S. & FORSYTH, K., 2020. The General Self-Efficacy of Older Adults receiving care: a Systematic Review and Meta-analysis.

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Review Article

The General Self-Efficacy of Older Adults Receiving Care: A Systematic Review and Meta-Analysis

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Abstract

Background and Objectives: General self-efficacy (GSE) encourages health-promoting behaviors in older adults. It is unsurprising then that older adults receiving health care services are reported to have a greater risk of low GSE than older adults who are not. Despite this, there is currently limited evidence investigating whether the effect differs based on the environment in which care is received. This review aims to determine whether the GSE of older adults is affected by the receipt of health care services and whether GSE varies based on the setting in which care is received.

Research Design and Methods: In accordance with PRISMA guidelines (PROSPERO registration number CRD42018092191), a systematic search was undertaken across 7 databases. Standardized mean differences (SMD) and mean General Self-Efficacy Scale scores, with 95% confidence intervals (CI), were pooled for meta-analysis.

Results: A total of 40 studies were identified, they consisted of 33 population cohorts that were included in the meta-analysis. Older adults receiving health care services were found to be at greater risk of having lower GSE than those who do not (SMD = −0.62; 95% CI: −0.96 to −0.27, $p < .0001$). Following identification of sources of heterogeneity, older adults receiving acute inpatient care were more likely to have lower GSE than those receiving care in other health care settings.

Discussion and Implications: Older adults receiving inpatient care have a greater risk of lower GSE, and consequently, poorer health-promoting behaviors. Further research is recommended that focuses on the GSE of older adults and health outcomes following discharge from inpatient care.

Keywords: Analysis—systematic review, Analysis—meta-analysis, Hospital/ambulatory care, Nursing homes, Home- and community-based care and services, Rehabilitation, Autonomy and self-efficacy

Background

Advances in medical care and public health mean that the world's older population is growing; between 2025 and 2050, the global population of adults aged 65 and over is predicted to almost double to 1.6 billion (United Nations, 2015).

With increasing age comes increasing multimorbidity and functional dependency, and the complex care required to manage these often increases health service use (He, Goodkind, & Kowal, 2015). As a result, the most frequent users of health care services are individuals aged between 75 and 80 years (Chawla, Betcherman, & Banerji, 2007; Peltzer et al., 2014). As the world's older population grows, health care utilization is increasing too, and is contributing to increasing health care expenditure (He, Goodkind, & Kowal, 2015; Rechel, Doyle, Grundy, & Mckee, 2009).

However, current evidence suggests that through extending the healthy life expectancy of older people,

lifetime health care expenditures may be reduced (Fried, 2011; He et al., 2015; Suhrcke, Arce, McKee, & Rocco, 2008).

Contemporary conceptual models of healthy aging are built around the functional ability of older people to participate in meaningful activities, promoting quality of life, and reducing dependency, rather than around the absence of disease. In order for health systems to adapt to population aging, public policy needs to adopt these models to support healthy aging, thus reducing the use of health care services and easing the financial pressures on health care systems (Rechel et al., 2009).

The ability of health care professionals to support healthy aging and extend the healthy life expectancy of older adult populations requires the identification of factors that indicate poor health-promoting behaviors. Correspondingly, there has been increasing focus on the role of positive psychological resources, which are expected to play a role in reducing suffering on the health of older adults (Santo & Daniel, 2018).

This field of research has frequently investigated the relationship between the health-promoting behaviors of older adults and general self-efficacy (GSE), which explains how individuals cope with daily struggles and adapt to stressful life events (Schwarzer, 1992). GSE is understood to be an operative construct, that is, it is related to subsequent behavior and, therefore, is relevant for clinical practice (Jones, Mandy, & Partridge, 2009; Schwarzer, 1992; Tousignant et al., 2012).

Older adults with lesser GSE have consistently been found to limit their involvement in activities of daily living (ADL) and reduce their efforts in activities they do complete (Easom, 2003). In contrast, those with a greater level of GSE are more proactive in seeking health information, engaging in self-care behaviors, making health modifications, and adhering to treatment (Easom, 2003; Kostka & Jachimowicz, 2010; Rodin, 1986; Stadtlander, Giles, & Sickel, 2015). Concerning health care use, increased health problems and increased contact with health care services may undermine older adults' GSE (Rodin, 1986). Moreover, it is suggested that the frequency or length of contact with the health care services may heighten these restrictions (Bandura, 1982; Woodward & Wallston, 1987). It is, therefore, of importance that GSE is considered and addressed by the health care services that aim to promote well-being and independence.

Current research has investigated the GSE of older adults receiving different levels and forms of health care provision in order to ascertain whether GSE interventions may improve the quality of life and healthy aging of older adults in the face of ill health (Bonsaksen, Lerdal, & Fagermoen, 2012; Cybulski, Cybulski, Krajewska-Kulak, & Cwalina, 2017; Kostka & Jachimowicz, 2010; Mystakidou et al., 2015). However, very little research has investigated whether there is any effect of the health care setting on the GSE of older adults, despite it being understood that the design of care settings may influence a range of patient health outcomes (Ulrich, Zimring, & Zhu, 2008).

Only one study has investigated the difference in levels of GSE between older adult populations receiving care in different health care settings. This study suggested that the form of health care an older adult receives may influence their level of GSE, with participants receiving acute inpatient care having lower GSE than individuals receiving rehabilitative or long-term care (Barder, Slimmer, & LeSage, 1994). While no further studies have assessed the GSE of older adults across multiple care settings, more recent research has investigated the difference in the GSE between populations of "healthy older adults" and "older adults receiving care." They shared the same intention of identifying whether specific populations have lower GSE and should be the first focus of intervention (Cybulski et al., 2017; Kim, Jeon, Sok, & Kim, 2006; Kostka & Jachimowicz, 2010; Schmidt, Wahl, & Plischke, 2014).

As GSE is understood to impact upon older adults' participation in ADL, their abilities to make health modifications and adjust to ill health (Easom, 2003; Kostka & Jachimowicz, 2010; Rodin, 1986; Stadtlander, Giles, & Sickel, 2015), interventions focused on enhancing older adults' GSE have been identified as having the potential to develop clinical practice and improve patient health outcomes.

However, it is recognized that GSE may be altered by the receipt of health care services and the environment in which they are received (Rodin, 1986; Ulrich et al., 2008). Previous research has focused on the effectiveness of GSE interventions; however, little attention has been paid to the difference in GSE between older adult populations receiving care in different health care settings.

In recognition of this, we conducted a systematic review and meta-analysis, using current evidence. We aimed to determine whether older adults' who receive health care services have lower GSE than those who do not, and to investigate whether older adults' receiving health care services are at risk of having lower GSE based on the environment in which care is received.

Methods

Protocol and Registration

This systematic review and meta-analysis were conducted in accordance with PRISMA guidelines (see Supplementary Material; Knobloch, Yoon, & Vogt, 2011). A review protocol was published with PROSPERO (registration number CRD42018092191).

Eligibility Criteria

This review included both observational and interventional study designs, providing they presented the mean score and standard deviation of the GSE scale used.

Participants were required to be "receiving care at the time of assessment." Decisions as to whether studies met this criterion were made by two members of the review team in consideration of the purpose of the study, the study procedure, and information given regarding the participants.

The most recent findings of the European Social Survey (Abrams, Russell, Vauclair, & Swift, 2011) found that the average perceived start of old age was 62 years (range: 55.1–68.2). Accordingly, each study population included in this review had to have a lower 95% confidence interval (CI) of at least 60 years old. No exclusion criteria limited the participants by gender, clinical diagnosis, length of care, or the type of care being received, assuming it was reported and could be categorized into "inpatient care," "outpatient care," or "community care."

Throughout GSE research, three GSE measures are routinely used. These are the Generalized Self-Efficacy Scale (GSES) (Schwarzer & Jerusalem, 1995), the 17-item, five-point scale, GSE section of the Self-Efficacy Scale (SES) (Sherer & Adams, 1983; Sherer et al. 1982), and the New General Self-Efficacy Scale (NGSES) (Chen, Gully, & Eden, 2001). All three of these tools demonstrate appreciable relationships with the latent construct of GSE (Scherbaum, Cohen-Charash, & Kern, 2006). Thus, studies that used one of these three measures were eligible for inclusion.

Finally, eligible studies had to be published in peer-reviewed journals and written in English.

Search Strategy

In September 2019, searches were conducted on MEDLINE (EBSCOhost), PsycINFO (EBSCOhost), CENTRAL (Cochrane Library), CINAHL (EBSCOhost), Scopus (Elsevier), Abstracts in Social Gerontology (EBSCOhost), and ASSIA (ProQuest).

Keywords followed the PICOS principles (see Supplementary Material for detailed search strategy), including:

Population: elder* or "elderly people" or "older adults" or "older people" or aged or "aged, 80 and over" or geriatric*

Intervention: "hospital" or "nursing home" or "institutionaliz*" or "rehabilitation"

Outcomes: "self-efficacy" or "self-efficacy" or "efficacy beliefs" or "control" or "subjective wellbeing."

Search terms were broad because narrowing them further resulted in eligible studies not being identified. This was primarily because titles and abstracts would either refer to participants' specific health condition rather than where their care was received, or they would state they measured "self-efficacy" but not the tool used.

It is difficult to generalize gerontological research conducted several decades ago to a population of today's older adults due to consecutive generations of older adults appearing strikingly different (Pew Research Centre, 2015; Rodin, 1986). Consequently, a date restriction of post-2000 was applied. Inspection of search results revealed that 95% of original studies were returned following restriction. Reference searches were conducted on studies eligible after full-text screening.

Study Selection

Titles and abstracts were screened for appropriateness (L. Whitehall); studies not meeting the previously defined selection criteria were eliminated. Quasirandom sampling, based on the first author's surname, was used to select 25% of the titles and abstracts, which were screened by a second member of the review team (N.D.) to prevent errors in methodology and reduce risk of bias.

The full text of remaining studies was retrieved and the decision to include in the review was made by the primary author and a second member of the review team (L.W. and N.D.). Disagreements regarding study eligibility were resolved through discussion with a third member (S.T.). Where decisions regarding eligibility were affected by missing data, attempts were made to contact the authors for clarification.

Risk of Bias Assessment

Quality assessment of studies should use tools specific to their study designs (Harrison, Reid, Quinn, & Shenkin, 2017). As such, the included studies were assessed for bias using the appraisal instruments outlined in Table 1.

Table 1. Risk of Bias Assessment Instruments for Included Studies

Study design	Assessment instrument
Cross-sectional	Quality Assessment Tool for Observational Cohort and Cross-Sectional
Observational cohort	Studies (National Heart, Lung, and Blood Institute [NIH], 2014b)
Before–after with no control group	Quality Assessment Tool for Before–After (Pre–Post) Studies with No Control Group (NIH, 2014a)
Randomized controlled trial	Risk of Bias Tool (Higgins et al. 2011)
Controlled before–after	Risk of Bias Tool (Higgins et al. 2011)
Mixed methods	Mixed Methods Appraisal Tool (Pluye et al., 2011)
Secondary analysis of existing data	The REporting of studies Conducted using Observational Routinely collected health Data (RECORD) Statement (Benchimol et al., 2015)

Studies were classified as having high, moderate, or low risk of bias, in relation to their respective study designs. This classification is included in Table 2. For each study, risk of bias was assessed by the primary author and a second member of the review team (N.D.), based on instrument guidelines.

Funnel plots of publication bias were not created due to the expected heterogeneity resulting from the descriptive, observational nature of most studies (Terrin, Schmid, Lau, & Olkin, 2003).

Data Extraction

The primary author extracted data using a prepiloted form adapted from the Joanna Briggs Extraction Form for Experimental and Observation Studies (Joanna Briggs Institute, 2014). This form comprised of four sections: general information, study design, participant characteristics, and general self-efficacy measure and score. A second member of the review team reviewed each completed form.

Data Synthesis

Information regarding each study characteristic was extracted and is shown in Table 2.

Studies that compared the GSE between older adults receiving care versus noncare were meta-analyzed in Stata (StataCorp, 2019) using standardized mean differences (SMD; Figure 2).

Using the mean (with standard deviation [*SD*]) GSES score from individual studies, pooled mean GSES scores, and *SD*s were produced in Stata to compare the GSE of older adults across different health care settings (Figures 3–5). These "health care settings" were "inpatient care," "outpatient care," and "community care."

Studies that recruited participants from inpatient wards, either acute medical or rehabilitative wards, were grouped together as "inpatient care." Studies that recruited participants from outpatient clinics or educational clinics were grouped under "outpatient care." Studies which recruited permanent residents of nursing homes were grouped under "community care" with studies concerning primary care providers (PCPs). This grouping of nursing homes reflects current literature regarding the provision of care within nursing homes: firstly, that any medical or rehabilitative care residents receive is primarily provided by community care services (e.g., community physiotherapists, or general practitioners) (Charles, 2019; Ghavarskhar, Matlabi, & Gharibi, 2018; Ribbe et al., 1997), and secondly, that nursing home residents are increasingly being seen as active members of communities (Tak, Kedia, Tongumpun, & Hong, 2015).

Effect Size Estimations

The SMD measure of effect was used to compare the GSE of older adults in receipt of health care services with the GSE of older adults who were not receiving health care services (Figure 2). An SMD of zero would demonstrate that older adults receiving care, versus noncare, had comparable GSE. If the SMD value is negative, the results indicate that older adults without care have greater GSE. In this meta-analysis, the precision of the studies effect estimate determined the weight given to the SMD of each study.

To compare the GSE of older adults across health care settings, the mean GSES scores (with *SD*s) reported in each individual study were used to calculate pooled means and *SD*s for each care setting. Mean scores were weighted based on the precision of the studies estimate (the narrowness of the CI; Figures 3–5).

The literature search identified only one study which used the NGSES (Chen et al., 2001) and six which used the SES (Sherer et al., 1982); as a result, these were only included in the meta-analysis of SMD as there were not enough studies to calculate their pooled mean scores.

All meta-analyses were conducted in Stata (StataCorp, 2019).

Missing Data

Eligible studies recruited "older adults," which was determined by a mean age and lower 95% CI of at least 60 years old. The lower 95% CIs were calculated using the mean age and the *SD* of each sample, using the formula $\bar{x} \pm 1.96\left(\frac{\sigma}{\sqrt{n}}\right)$, where $\bar{x}$ is the sample mean, σ is the *SD*, and n is the sample size (Lane, 2020).

All but one study reported their samples age as a mean with the *SD*. Carlstedt, Lexell, Pessah-Rasmussen, and Iwarsson (2015) reported the mean age and the age range of their participants. To ensure that this study met the inclusion criteria, the *SD* of the sample mean was estimated using the range rule for *SD* ($\sigma \approx \frac{b-a}{4}$, where a is the minimum value and b is the maximum value [Ramirez & Cox, 2012]). Estimating the *SD* enabled the lower CI for the mean age to be estimated.

Eligible studies also had to report the GSE scale score of their participants. Mean GSE scale scores with standard deviations were required to carry out the meta-analyses. All the included studies provided these data; consequently, no further imputation of missing data was required.

Assessment of Heterogeneity

For the meta-analysis of SMD, the I^2 and chi-square statistics for heterogeneity were calculated. A random-effects model was applied given the clinical and methodological diversity across the included studies (Terrin et al., 2003).

Sensitivity Analysis

Sensitivity analysis was performed using subgroup and leave-one-out analysis. Leave-one-out analysis is performed by omitting one study at a time to measure its individual

Table 2. Characteristics of the 40 Included Studies

Study	Country	Care setting	Diagnosis	Number of participants who completed GSE measure	% of males	Age (SD) (years)	Self-efficacy measure/baseline score	Risk of bias
Barnes-Harris et al. (2019)	United Kingdom and Australia	Outpatient clinics	Chronic breathlessness	41	59	70.5 (5.17)	Secondary data analysis of Johnson et al. (2016) and Swan et al. (2019)	Moderate
Bonsaksen et al. (2012)	Norway	Patient education course	Chronic obstructive pulmonary disease (COPD)	86	53	64.4 (9.7)	GSES 27.6 (6.4)	Moderate
Bonsaksen et al. (2013)	Norway	Patient education course	COPD	60	53	64.5 (9.4)	Same data as Bonsaksen et al. (2012)	Moderate
Bonsaksen et al. (2014)	Norway	Patient education course	COPD Obese group excluded due to age	56	58.9	66.3 (9.1)	Same data as Bonsaksen et al. (2012)	Low
Carlstedt et al. (2015)	Sweden	Outpatient clinic	Stroke	34	61.8	68.1	GSES 31.7 (6.95)	Moderate
Curtis, Groarke, and Sullivan (2014)	Ireland	Rapid access prostate hospital clinic	Prostate cancer	89	100	64.62 (8.02)	GSES 30.6 (5.64)	Low
Cybulski et al. (2017)	Poland	Nursing home	—	300 (nursing home = 100)	29 (overall)	60+	GSES NH: 24.38 (7.67) Community: 29.71 (3.88)	Low
Fan and Lv (2016)	China	Acute hospital cardiovascular wards	Chronic heart failure	159	47	63 (13.5)	GSES 26.11 (6.459)	Low
Feldstain et al. (2016)	Canada	Outpatient palliative rehabilitation	Stage 3/4 cancer	80	47.5	64.04 (12.5)	GSES 27.86 (6.16)	Low
Fors et al. (2018)	Sweden	Acute inpatient hospital	COPD and/or chronic heart failure	221 (intervention group = 103)	50.5 (intervention) 41.5 (control)	78.3 (9.5) (intervention) 76.9 (8.3) (control)	GSES Intervention: 28.1 (6.5) Control: 28.5 (5.8)	Unclear
Fu et al. (2018)	China	Nursing homes	—	307	29.3	60+	GSES 27.93 (5.6)	Low
Ghielen et al. (2017)	Netherlands	Outpatient clinic	Parkinson's disease	19	55	66.6 (8.4)	GSES 28.5 (4.56)	Low
Haugland et al. (2016)	Norway	NET centers (outpatient)	Neuroendocrine tumors	196	49.5	65 (11)	GSES 29.9 (5.5)	Low
Huygens et al. (2017)	Netherlands	General practices	Chronic illness	627	49.9	65.1 (11.6)	GSES 3.12 (0.6)	Low
Iannello et al. (2018)	Italy	Inpatient rehabilitation	Hip fracture	42 (intervention group = 21)	28.5	79.95 (8.93) (intervention) 79.31 (9.12) (control)	GSES Intervention: 34.1 (7.5) Control: 32.7 (7.4)	Unclear
Johnson et al. (2016)	United Kingdom and Australia	Outpatient clinics	Refractory breathlessness	49 (intervention group = 24)	50 (intervention) 56 (control)	68.5 (11.6) (intervention) 67.7 (8.7) (control)	GSES Intervention: 30.2 (5.8) Control: 32.0 (4.4)	Low
Kim et al. (2006)	Korea	"Institutionalized"	—	214 (institutionalized = 106)	54.7 (institutionalized) 41.7 (noninstitutionalized)	65+	SES Institutionalized: 3.01 (0.44) Noninstitutionalized: 3.29 (0.42)	Low

Table 2. Continued

Study	Country	Care setting	Diagnosis	Number of participants who completed GSE measure	% of males	Age (*SD*) (years)	Self-efficacy measure/baseline score	Risk of bias
Kosmat and Vranic (2017)	Croatia	Residential care home	—	22 (intervention group = 12)	25 overall	80.08 (6.156) (intervention) 79.08 (3.615) (control)	GSES Intervention: 3.3 (0.44) Control: 3.1 (0.56)	Unclear
Kostka and Jachimowicz (2010)	Poland	Nursing home	—	224 (nursing home = 112)	22.3 (nursing home) 21.5 (veterans' home) 23.6 (community)	78.9 (6.9) (NH) 77 (7.6) (veterans' home) 69.6 (4.6) (community)	GSES NH: 30.4 (7) Community: 30.9 (5.5)	Low
Lai et al. (2018)	Hong Kong	Nursing homes	—	96	34.4	84.6 (7.24)	GSES 21.55 (7.47)	Moderate
Lewin, Jöbges, & Werheid (2013)	Germany	Inpatient neurological rehabilitation	Stroke	96	52	67.08 (10.55)	Same data as Volz et al. 2018	Moderate
Liu et al. (2018)	China	Inpatient neurology wards	Ischemic stroke	147	63.3	68.57 (6.73)	GSES 25.6 (5.8)	Low
Magklara and Morrison (2016)	United Kingdom	Presurgery educational clinic	Prejoint replacement	53	33.3	69.33 (8.57)	GSES 31.19 (5.2)	Moderate
Mystakidou, Parpa, Tsilika, Galanos, & Vlahos (2008)	Greece	Inpatient palliative care unit	Palliative cancer	99	40.4	63.1 (14)	Same data as Mystakidou, Tsilika, et al. 2010	Low
Mystakidou, Tsilika, et al. (2010)	Greece	Inpatient palliative care unit	Palliative cancer	99	40.4	63.5 (13.2)	GSES 28.29 (6.9)	Low
Mystakidou, Parpa, et al. (2010)	Greece	Outpatient radiotherapy	Cancer	90 (male = 41) Female group excluded due to age	45.6	65.63 (12.48) (male) 57.45 (13.83) (female)	GSES Males: 33.17 (4.9)	Low
Mystakidou et al. (2012)	Greece	Outpatient palliative care	Cancer chronically ill group excluded due to age	107	51.4	64.52 (12.84)	GSES Cancer: 25.73 (6.0)	Low
Mystakidou et al. (2013)	Greece	Outpatient radiotherapy	Cancer	90	45.6	61.17 (5.2)	Same data as Mystakidou, Parpa, et al. 2010	Low
Mystakidou et al. (2015)	Greece	Outpatient palliative care	Palliative cancer	115	52.2	64.84 (12.7)	GSES 26.01 (6.11)	Low
Neuman et al. (2019)	United States	Inpatient hospital ward	Hip fracture	20	25	72 (10.96)	GSES 32.8 (6.2)	Moderate
Rotenberg Shpigelman, Sternberg, & Maeir (2019)	Israel	Geriatric clinics	Subjective memory complaints	91 (receiving care = 51)	45.1 (care receivers) 32.5 (not receiving care)	79.98 (7.33) (care receivers) 78.28 (7.4) (not receiving care)	NGSES Care receivers: 23.4 (6.1) Not receiving care: 26.4 (3.7)	Low
Schmidt et al. (2014)	Germany	Outpatient memory clinic	Mild cognitive impairment (MCI)	53 (MCI = 26)	46.7 (MCI) 47 (cognitively healthy)	72.5 (5.8) (MCI) 73.1 (7.0) (cognitively healthy)	GSES MCI: 28.5 (5.1) Cognitively healthy: 33.7 (5)	Low
Schulz et al. (2015)	Germany	Primary care	Osteoarthritis	1,018	31.1	74.9 (5.17)	GSES 32.7 (5.9)	Moderate
Stadlander et al. (2015)	United States	Primary health care	—	35	17.1	88.4 (3.12)	GSES 31.3 (4.6)	Moderate

Table 2. Continued

Study	Country	Care setting	Diagnosis	Number of participants who completed GSE measure	% of males	Age (*SD*) (years)	Self-efficacy measure/baseline score	Risk of bias
Strupeit et al. (2013)	Germany	Inpatient geriatric Rehabilitation	Mobility impairment	124 (intervention group = 39)	87.2 (intervention) 32.9 (control)	83.72 (6.87) (intervention) 83.44 (8.71) (control)	GSES Intervention: 25.97 (5.13) Control: 26.1 (6.25)	Moderate
Susanto et al. (2019)	Indonesia	"Institutional care"	Hypertension	64	59.4	71.86 (9.94)	GSES 27.88 (6.59)	Moderate
Swan et al. (2019)	United Kingdom	Outpatient clinics	Chronic breathlessness	40	70	72 (9.8)	GSES 31.03 (5.85)	Low
Tousignant et al. (2012)	Canada	Geriatric Day hospital	Falls	152 (intervention group = 76)	25 (intervention) 29 (control)	79.1 (6.4) (intervention) 80.7(6.0) (control)	GSES Intervention: 27.7 (6.2) Control: 29.2 (5.4)	Low
Volz et al. (2016)	Germany	Neurological inpatient rehabilitation	Stroke	88	54.5	66.35 (10.7)	Same data as Volz et al. 2018	Low
Volz et al. (2018)	Germany	Neurological inpatient rehabilitation	Stroke	294	58.9	63.78 (10.83)	GSES 31.25 (5.98)	Low

Note: GSE = General self-efficacy; GSES = Generalized Self-Efficacy Scale; SES = Self-Efficacy Scale; NH = nursing home; COPD = chronic obstructive pulmonary disease; MCI = mild cognitive impairment.

effect on the pooled estimate of the rest of the studies (Viechtbauer & Cheung, 2010). This leave-one-out analysis also enabled the examination of outliers and influential statistics, thus identifying sources of heterogeneity.

Outcomes

The search of online databases in September 2019 identified 18,706 publications. Following the exclusion of duplicates and the screening of titles and abstracts, 1,492 studies proceeded to full-text screening, a further 11 records were identified through manual searching of reference lists. Of these, 1,462 failed to meet the specified selection criteria, and one article was not accessible. The primary reason for exclusion was due to the assessment measure used; these primarily measured domain-specific self-efficacy (e.g., exercise self-efficacy). In total, 40 studies were eligible for this review (Figure 1).

Study Characteristics

Study characteristics are reported in Table 2. Publication dates of the selected studies ranged from 2004 to 2019, with data from populations in the United States, Canada, Asia, Europe, and Australia. Studies included 33 different population cohorts, with sample sizes ranging from 19 to 1,018 participants and mean age between 63 and 88 years. One study recruited males only; in other studies, the proportion of males varied from 17.1% to 63.3%. Cross-sectional analysis was used in 23 studies, eight studies were randomized controlled trials (RCTs), three were cohort studies, four were pre–post studies with no control group; one study

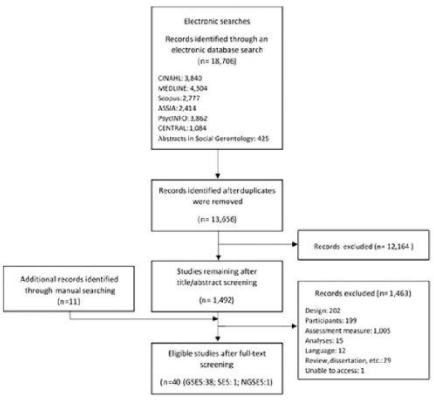

Figure 1. PRISMA diagram for study selection. GSES = Generalized Self-Efficacy Scale; NGSES = New General Self-Efficacy Scale; SES = Self-Efficacy Scale.

was a controlled, nonrandomized, pre–post study, and one followed a convergent mixed-methods design.

Participants

A total of 4,731 participants receiving health care services were included in the review; of these, 49% received community care, 23.4% received inpatient care and 24% received outpatient care, and 3.6% of participants were described as "institutionalized" (Table 2).

Self-Efficacy Measures

One study used the SES (Sherer & Adams, 1983), 38 studies used the GSES (Schwarzer & Jerusalem, 1995), and one study used the NGSES (Chen et al., 2001).

Risk of Bias

Of the 40 studies, 25 were rated as having a "low risk of bias," 12 were given a rating of "moderate risk of bias," and three studies did not provide enough details to award a rating and so were categorized as having an "unclear" risk of bias. These ratings are given in Table 2.

The majority of the studies included in this review were of a cross-sectional design, most were deemed to have a "low risk of bias" due to high participation rates, use of defined recruitment criteria and standardized outcome measures, and controlling of potential cofounders. Due to the study design, there was also no loss to follow up. Studies that received "moderate risk of bias" ratings tended to not present discussion around its sample size, recruited less than 50% of eligible individuals or did not control for cofounders.

Within the cohort and pre–post studies, the greatest risk of bias came from loss to follow up. Percentages of loss ranged from <20% (Mystakidou et al., 2013; Volz, Möbus, Letsch, & Werheid, 2016) to > 50% (Bonsaksen, Fagermoen, & Lerdal, 2014; Neuman, Gaskins, & Montgomery, 2019). Studies accounted for loss to follow up through multiple imputation (Feldstain, Lebel, & Chasen, 2016), average imputation (Bonsaksen, Haukeland-Parker, Lerdal, & Fagermoen, 2013; Bonsaksen et al., 2014), and/or listwise deletion when data were deemed to be missing at random (Bonsaksen et al., 2013; Bonsaksen et al., 2014; Neuman et al., 2019). Volz, Voelkle, and Werheid (2018) adopted a continuous time perspective in which missing longitudinal data were translated into a problem of unequal time intervals.

Eight RCTs were included in this review; of these, six stated their study design and group characteristics in enough depth to determine that there was low risk of selection bias (Fors et al., 2018; Ghielen et al., 2017; Johnson, Booth, Currow, Lam, & Phillips, 2016; Lai et al., 2018; Swan, English, Allgar, Hart, & Johnson, 2019; Tousignant et al., 2012). The studies by Kosmat and Vranic (2017), Iannello and colleagues (2018), and Fors and colleagues (2018) were found to be of "unclear" risk of bias due to lack of detail regarding the randomization of participants and concealment of the groups.

With regards to performance bias, three RCTs did not blind their participants (Ghielen et al., 2017; Johnson et al., 2016; Swan et al., 2019), while four were unable to blind personnel as they were delivering the interventions (Johnson et al., 2016; Kosmat & Vranic, 2017; Swan et al., 2019 Tousignant et al., 2012). Regarding detection bias, only two studies blinded their outcome assessors (Lai et al., 2018; Tousignant et al., 2012). Finally, two studies did not report details regarding the blinding of either their participants or their outcome assessors (Fors et al., 2018; Iannello et al., 2018).

The RCTs are, therefore, at various risks of performance or detection bias. However, the use of functional performance measures, and measures that required the self-report of blinded participants, reduced the risk of bias in each study. This is similar in the quasi-experimental study by Strupeit, Wolf-Ostermann, Bu, and Dassen (2013). Additionally, the studies by Johnson and colleagues (2018) and Swan and colleagues (2019) were feasibility trials and so, the authors judged that their lack of blinding was not likely to influence the outcome of the studies as the source of bias would be consistent across study arms. Furthermore, the aim of the studies was to measure variability in response to measures to inform a further RCT.

Finally, the included convergent mixed-methods study (Stadtlander et al., 2015) was of appropriate design for its research aims and had a response rate of 100%. However, the sampling strategy resulted in few participants and the effect of the achieved sample size on the quantitative portions of the study was not discussed, increasing the risk of selection bias.

Results

The GSE of Older Adults and Receipt of Health Care Services

Five studies investigated the difference in GSE between a population of older adults receiving health care services, and a population of older adults who were not receiving care.

Pooling study effects demonstrated statistically significantly lower GSE in older adults receiving health care services than in older adults not receiving care (SMD = −0.62, CI: −0.96 to −0.27, $p < .0001$; $n = 5$, No. receiving care: 395, No. without care: 385; Figure 2).

The GSE of Older Adults Across Different Health Care Settings

Thirty-one eligible studies used the GSES and published the mean scores of their participants (nine community, eight inpatients, and 14 outpatients; Figure 3); their GSES scores

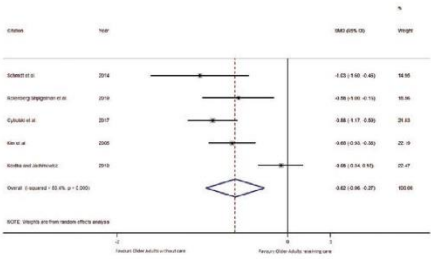

Figure 2. Forest plot demonstrating significantly lower GSE in older adults receiving care relative to older adults who are not receiving care. CI = confidence interval; GSE = General self-efficacy; SMD = standardized mean differences.

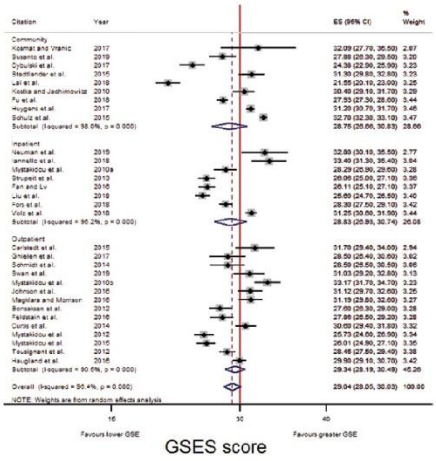

Figure 3. Forest plot: Comparison of GSES scores across three care settings. CI = confidence interval; GSES = Generalized Self-Efficacy Scale.

were pooled and forest plots produced. Reference lines were fixed at 30 as it is suggested that a GSES score of less than 30 is indicative of low self-efficacy (Haugland, Wahl, Hofoss, & DeVon, 2016).

Across all three settings, the pooled mean score was similar, being only very slightly higher in older adults receiving outpatient care (29.34 [28.19, 30.49]), compared with older adults receiving inpatient (28.83 [26.93, 30.74]) and community care (28.75 [26.66, 30.83]; Table 3).

As studies had been grouped broadly, subgroup analysis was carried out. Six subgroups were formed, with studies grouped into those which recruited participants from nursing homes, PCPs, acute inpatient wards, inpatient rehabilitation wards, outpatient clinics, or educational courses.

Table 3. Comparison of GSES Scores Across Care Settings at Different Stages of Analysis

	Initial meta-analysis		Subgroup analysis			Post-leave-one-out analysis	
Setting	*N*	Mean (95% CI)	Setting	*n*	Mean (95% CI)	*n*	Mean (95% CI)
Community	2,381	28.75 (26.66, 30.83)	Nursing homes	701	27.13 (24.55, 29.70)	701	27.13 (24.55, 29.70)
			Primary care providers	1,680	31.80 (30.59, 33.00)	1,680	31.80 (30.59, 33.00)
Inpatient	1,106	28.83 (26.93, 30.74)	Acute medical	626	27.05 (25.61, 28.50)	527	26.68 (24.96, 28.41)
			Rehabilitation	480	30.77 (27.39, 34.15)	356	32.17 (30.64, 33.70)
Outpatient	1,087	29.34 (28.19, 30.49)	Clinic	948	29.33 (28.05, 30.61)	605	29.93 (29.08, 30.78)
			Education	139	29.39 (25.87, 32.91)	139	29.39 (25.87, 32.91)

Note: CI = confidence interval; GSES = Generalized Self-Efficacy Scale.

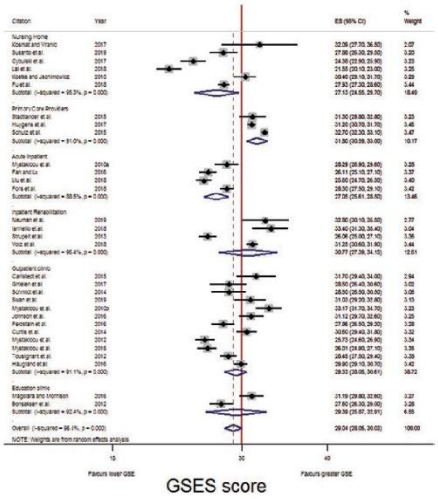

Figure 4. Forest plot: Comparison of GSES scores across six care settings. CI = confidence interval; GSES = Generalized Self-Efficacy Scale.

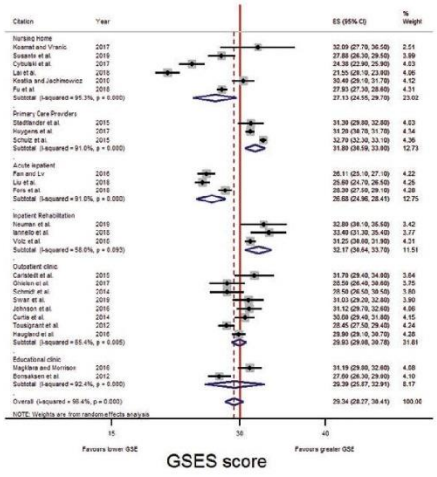

Figure 5. Forest plot: Comparison of GSES scores across six care settings, following leave-one-out analysis. CI = confidence interval; GSES = Generalized Self-Efficacy Scale.

Following subgroup analysis (Figure 4), older adults receiving care provided by PCPs had the greatest GSES score (31.80 [30.59, 33.00]), followed by inpatients in a rehabilitation ward (30.77 [27.39, 34.15], then those attending education courses (29.39 [25.87, 32.91]), then those attending an outpatient clinic (29.33 [28.05, 30.61]), followed by residents of nursing homes (27.13 [24.55, 29.70]), and lastly, those receiving acute medical inpatient care (27.05 [25.61, 28.50]; Table 3).

Heterogeneity was observed among the GSES scores in each subgroup. Leave-one-out analysis was performed to measure each study individual effect on the pooled estimate of the studies. Leave-one-out analysis could not be carried out with the educational course subgroup, due to only two studies being included.

Following leave-one-out analysis (Figure 5) older adults receiving inpatient care in a rehabilitation ward had the greatest GSES score (32.17 [30.64, 33.70]), followed by those attending their PCPs (31.80 [30.59, 33.00]), then those attending an outpatient clinic (29.93 [29.08, 30.78]), then those attending an educational course (29.39 [25.87, 32.91], then residents of nursing homes (27.13 [24.55, 29.70]), and lastly, those receiving acute medical inpatient care (26.68 [24.96, 28.41]; Table 3). Additionally, there was no overlap in 95% CIs for pooled GSES score between acute medical inpatient care and inpatient rehabilitation care, outpatient clinic care, or PCPs. Studies conducted in nursing homes and educational courses continued to demonstrate considerable heterogeneity.

Discussion

The SMD highlighted a significant difference between the GSE scores of those receiving care and those who did not receive health care services. This supports the theory that GSE is contextual and may be influenced by the level and form of health care an older adult is receiving.

Additionally, our findings support Barder and colleagues (1994), who found that individuals receiving acute inpatient care services are at risk of having poorer GSE than those receiving community care.

While Haugland and colleagues (2016) suggest a GSES score of less than 30 is indicative of a low self-efficacy score of clinical significance, Schwarzer (2014) recommends that levels of self-efficacy are determined based on the empirical distributions of a particular reference population. In this analysis, the mean GSES score for all older adults, following leave-one-out analysis, was 29.34 (28.27, 30.41). In comparison, the GSES score of older adults receiving care was 27.13 (24.55, 29.70) in nursing homes, 31.80 (30.59, 33.00) in PCPs, 26.68 (24.96, 28.41) in acute inpatient settings, 32.17 (30.64, 33.70) in inpatient rehabilitation settings, 29.93 (29.08, 30.78) in outpatient clinics, and 29.39 (25.87, 32.91) in educational courses.

These findings suggest that following the experience of an unexpected admission to hospital, and increased reliance on health care professionals, older adults receiving inpatient care may perceive an increased inability to cope with and adapt to stressful life events; thus, reducing their GSE. Barder and colleagues (1994) support this finding as they concluded that individuals receiving acute inpatient care

had reduced preference for control over health care than older adults receiving care in other settings. Furthermore, the results of Iannello and colleagues (2018) suggest that receiving inpatient care may reduce an older adults' GSE, as their control group, who received standard inpatient care, had a reduction in GSE during their admission.

Recent research has investigated the relationships between demographic factors and older adults' self-efficacy, suggesting that it is likely to be affected by factors such as age, relationship status, and education (Hur, 2018). The studies included in this review do not support this judgment. Several studies included in this review assessed the relationships between GSE and demographic factors, including age, gender, education, relationship status, and social support; only social support was found to be significantly related to GSE in over half of the studies it was investigated in (see Supplementary Material for the reported bivariate relationships between GSE and demographic variables).

Conducting leave-one-out analyses identified other potential factors that may influence the relationship between the health care setting and older adults' GSE.

Firstly, the present review supports the premise that there is a relationship between illness severity, or illness perception, and GSE, as leave-one-out analysis identified that studies that recruited palliative care patients had lower GSES mean scores, and significantly increased the heterogeneity in the analysis. Moreover, the study by Mystakidou, Parpa, and colleagues (2010), which recruited patients receiving curative radiotherapy, was also found to be a source of heterogeneity and was also removed following leave-one-out analysis (Figure 4).

Considerable heterogeneity was also observed within the community-based studies. Conducting subgroup analysis highlighted the substantial variation in the GSE of nursing home residents. Though the reason for this is unclear, previous research has found that within nursing homes factors such as adaption to facility, decision to enter, the quality of care, length of stay, and social engagement influence the GSE of their residents (Chang, Park, & Sok, 2013; Choi & Sok 2015; Fu, Liang, An, & Zhao, 2018; Susanto, Rasny, Susumaningrum, Yunanto, & Nur, 2019). Nevertheless, these factors were not investigated consistently across the studies, and so the suggestion that they may contribute to the observed heterogeneity is speculative.

Previous research has also found that health care provision within nursing homes varies substantially across countries, with some including rehabilitative services (often those in the United States) while others have no, or very limited, access to rehabilitative services (e.g., in the United Kingdom, Denmark, Italy, China, and Australia) (Ghavarskhar et al., 2018; Ribbe et al., 1997). Given that this study found that older adults receiving inpatient rehabilitative care had greater GSE than those residing in nursing homes, it may be that individuals who receive rehabilitative services in nursing homes have higher GSE than those who do not. However, of the nursing home studies included in this review, only Susanto and colleagues (2019) mentioned that residents were receiving rehabilitative services, and their participants did not demonstrate higher GSE.

Finally, within the inpatient rehabilitation studies, the study by Strupeit and colleagues (2013) was found to be significantly heterogeneous. Unlike Iannello and colleagues (2018) and Neuman and colleagues (2019) who recruited participants following hip surgery, Strupeit and colleagues (2013) recruited participants with a diagnosis of functional mobility impairment or stroke. While Volz and colleagues (2018) also recruited stroke patients, their participants were approaching discharge, while Strupeit and colleagues (2013) recruited their participants shortly after they had been admitted. Strupeit and colleagues (2013) also recruited participants who resided either at home or at a nursing home. It is suggested, therefore, that the observed heterogeneity could also be explained by the illness perception of its participants or their place of residence.

Limitations

This study is the first systematic review and meta-analysis to explore the differences in GSE between older adults receiving care in different health care settings. However, there are some limitations.

Firstly, GSE measures are used intermittently in research with a range of study designs, in various settings and with various population groups. As a result, analysis stratified by demographic or detailed clinical variables of participants was not prespecified, and observational study designs of reduced rigor were included. This limitation is highlighted in the substantial methodological heterogeneity between included studies; for this reason, no tests for heterogeneity were conducted between subgroups. Despite this, this review attempted to address the observed heterogeneity using a random-effects model, while subgroup and leave-one-out analyses were carried out to assess the robustness of the conclusions and to identify causes of heterogeneity (Higgins, 2008).

Secondly, imputation of data can decrease the certainty that can be placed in the results of this meta-analysis. However, only one study (Carlstedt, Lexell, Pessah-Rasmussen, & Iwarsson, 2015) included in this review required the imputation of data. Furthermore, it was for the 95% CI of the participants mean age and not data related to the GSES score. It is also deemed unlikely that the true 95% CI of the participants' ages would have excluded this study from the review because the participants mean age was 68.1 (range: 58–86).

Lastly, language bias may also be considered as only studies that were published in the English language were selected; though the studies were conducted across a wide range of geographical locations, they comprised largely European populations.

Clinical and Research Implications

GSE is an operative construct, that is, it is related to subsequent behavior and, therefore, is relevant for clinical practice and behavior change (Schwarzer, 1992). Considering the continued growth of the older population and given that GSE is predictive of positive health behaviors, it is of importance that GSE is considered and addressed in the care of older adults.

This systematic review and meta-analysis found that individuals receiving acute inpatient care are at risk of having lower GSE, in comparison with those in inpatient rehabilitation settings, attending outpatient clinics, or receiving PCP care. Additionally, the study by Iannello and colleagues (2018) suggests that older adults' GSE may reduce during inpatient admission.

This finding should, however, be interpreted with caution, as the difference in findings of Volz and colleagues (2018) and Strupeit and colleagues (2013) suggest that GSE may increase as individuals approach to discharge. This finding is not dissimilar to the results of Tousignant and colleagues (2012), who found that while the GSE of their control group increased, after receiving standard day-hospital physiotherapy, a larger and longer-lasting improvement in GSE was seen in their experimental group, who received tailored tai-chi interventions instead. It is proposed, therefore, that even if GSE routinely increases closer to inpatient discharge, there is the potential for this to be enhanced.

Previous research has shown that interventions can be successful in improving the GSE of older adults (Jones et al., 2009; Tousignant et al., 2012). However, it is proposed that these interventions need to involve the active participation of the older adult, as a study that investigated the efficacy of increased nurse-led consultations following stroke rehabilitation found no significant differences in the final GSES scores of their intervention and control group (Strupeit et al., 2013). Furthermore, they should be based on everyday activities of older adults, or something that can be easily built into everyday life, as literature suggests that older adults need more tangible everyday experiences to bring about changes in subjective well-being (Enkvist, Ekström, & Elmståhl, 2012). GSE interventions differ from patient empowerment and engagement interventions, which are also being encouraged as a way to improve health, policy, and service delivery (World Health Organization [WHO], 2016).

Patient empowerment interventions often focus on education (WHO, 2016). Through education patients' ability to act independently increases, encouraging them to engage in their own health management tasks (Khuntia, Yim, Tanniru, & Lim, 2017). In contrast, GSE interventions should focus on providing mastery experience, enabling patients to successfully complete tasks so that they feel more confident in attempting new behaviors (Köhler, Tingström, Jaarsma, & Nilsson, 2018). Successful engagement in health-related tasks may increase GSE; however, Köhler and colleagues (2018) warn that patient empowerment and GSE are not interchangeable, and that both need to be considered when planning health care provision.

Concerning older adults residing in nursing homes, the findings of this review suggest that they have the potential to have some of the highest and lowest levels of GSE among older adult populations. Nursing home managers should consider how they could foster their residents' GSE because low GSE in nursing home residents is significantly related to both shorter life expectancy and greater death anxiety (Shokri & Akbari, 2016). The discussion has touched upon factors that have been found to influence the GSE of older adults residing in nursing homes; those that are modifiable should be considered as ways to improve residents' GSE.

Considering the results of this review, we recommend that future research should focus on:

Firstly, the implementation and effectiveness of GSE interventions in inpatient care settings. Low GSE is understood to be a predictor of both negative health outcomes and poorer protective personality characteristics, such as resilience (Liu, Zhou, Zhang, & Zhou 2018; Stadtlander et al., 2015). As such, health care recommendations suggest that development of GSE-focused interventions will aid complex decision making in the healthcare of older adults (Hardy, Concato, & Gill, 2004; Hicks & Conner 2014; Kulakçi & Emiroğlu 2013; Lee et al. 2013). Consequently, research is needed that investigates the relationships between GSE and other protective personality characteristics in older adults receiving inpatient care and their subsequent, postdischarge, health outcomes.

Finally, given that palliative care studies were found to be a large source of heterogeneity in this review, further research is needed to investigate whether the setting in which palliative care is given impacts upon the GSE of those receiving the care, and whether the setting could be altered to improve the quality of life of older adults approaching the end of their life.

Supplementary Material

Supplementary data are available at *The Gerontologist* online.

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Conflict of Interest

None reported.

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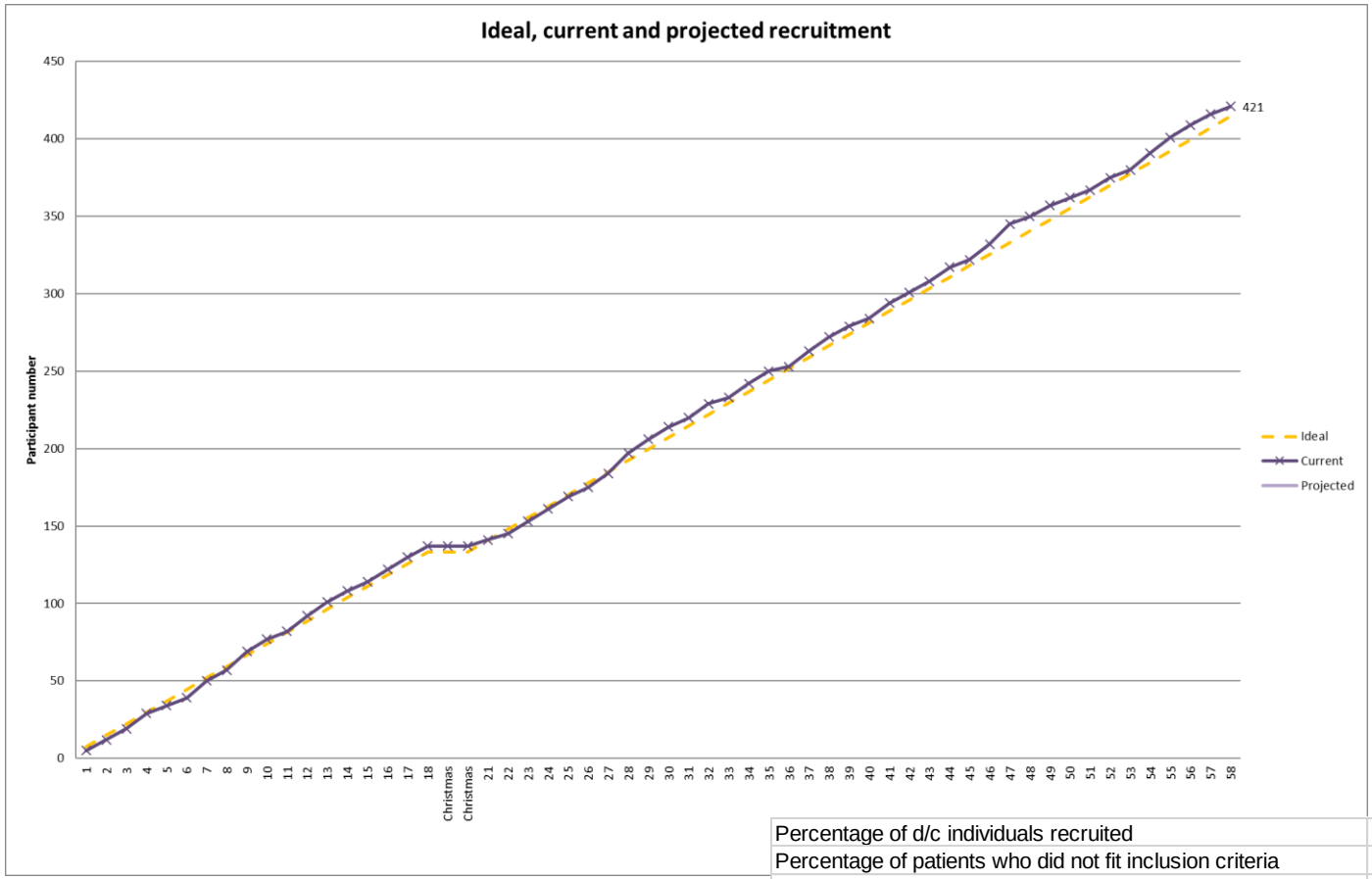
Appendix 3 - Recruitment graph and statistics



Percentage of d/c individuals recruited	25.6%
Percentage of patients who did not fit inclusion criteria	64.5%
Percentage of eligible d/c individuals recruited	72.1%
Percentage of eligible d/c individuals not recruited	23.5%
Percentage of eligible d/c individuals who declined	12.0%
Average number of participants per week:	7.517857143

NHS
Health Research Authority

North West - Lancaster Research Ethics Committee

Barlow House
3rd Floor
4 Minshull Street
Manchester
M1 3DZ

Please note: This is the favourable opinion of the REC only and does not allow the amendment to be implemented at NHS sites in England until the outcome of the HRA assessment has been confirmed.

02 July 2018

Dr Kirsty Forsyth
Professor
Queen Margaret University Edinburgh
Queen Margaret Drive
Musselburgh
EH21 6UU

Dear Dr Forsyth

Study title:	**Establishing the predictive validity of the Making it CLEAR questionnaire**
REC reference:	**16/NW/0077**
Protocol number:	**N/A**
Amendment number:	**Substantial Amendment 1**
Amendment date:	**31 May 2018**
IRAS project ID:	**189746**

This amendment is to notify the Sub Committee of changes to the Protocol, PIS and Consent Form,

The above amendment was reviewed 28 June 2018 by the Sub-Committee in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

The Sub Committee raised no ethical issues with this amendment

Approved documents

The documents reviewed and approved at the meeting were:

Document	*Version*	*Date*
Notice of Substantial Amendment (non-CTIMP)	Substantial Amendment 1	31 May 2018
Other [Summary CV Researcher 1]	3.0	24 May 2018
Other [Summary CV Researcher 2]	1.0	24 May 2018
Other [Substantial and Non- substantial Amendment Log]		01 June 2018
Participant consent form [Participant Consent form and Baseline Questionnaires]	4.0	31 May 2018
Participant information sheet (PIS) [Information Leaflet]	4.0	31 May 2018
Research protocol or project proposal	3.0.	31 May 2018

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

Working with NHS Care Organisations

Sponsors should ensure that they notify the R&D office for the relevant NHS care organisation of this amendment in line with the terms detailed in the categorisation email issued by the lead nation for the study.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our Research Ethics Committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

16/NW/0077: Please quote this number on all correspondence

Yours sincerely

pp

Professor Carol Haigh

Queen Margaret University
EDINBURGH

Lucy Whitehall
PhD Candidate
School of Health Sciences

Lucy Hinds
Quality Enhancement Officer
Queen Margaret University
Queen Margaret University Drive
Musselburgh
East Lothian EH21 6UU

Tel: 0131 474 0000
Email: researchethics@qmu.ac.uk

07 June 2019

Dear Lucy,

Study Title: Establishing the predictive validity of the Making it CLEAR questionnaire

I am writing to confirm that this study is exempt from Queen Margaret University Research Ethics Panel approval. The Panel does not require researchers to apply for ethical approval from QMU when NHS R&D approval has already been granted through IRAS.

Yours sincerely

Lucy Hinds
Secretary to the Research Ethics Panel

DIVISION OF GOVERNANCE AND QUALITY ENHANCEMENT
QUEEN MARGARET UNIVERSITY, EDINBURGH
MUSSELBURGH
EAST LOTHIAN EH21 6UU
TELEPHONE: 0131 474 0000

CONSENT FORM

Establishing Predictive Validity of *making it* CLEAR

Please initial box

I confirm that I have read and understand the information sheet (31.05.2018, v4.0) for the above study. I have had the opportunity to consider the information, ask questions and have had these questions answered satisfactorily ☐

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without my medical care and/or legal rights being affected ☐

I give permission for the research team to access my medical records for the purposes of this research study ☐

I understand that relevant sections of my medical notes and data collected during the study may be looked at by individuals from Queen Margaret University and from the NHS. I give permission for these individuals to have access to my data and/or medical records ☐

I give permission for my personal information (including name, postcode, date of birth and consent form) to be passed to Queen Margaret University for administration of the study ☐

I give permission for my Community Health Index (CHI) number to be collected and passed to Queen Margaret University ☐

I agree to my anonymised data being used in future studies and for educational purposes Yes ☐ No ☐

I agree to take part in the above study ☐

....

Your name Your signature

Your date of birth: ..... Your postcode: .....

....

Name of person receiving consent Signature

Consent Form and Baseline Questionnaire v.5.0;Substantial Amendment 2; 16/07/2018

SF-12v2®: Patient Questionnaire

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. *Thank you for completing this survey!*

For each of the following questions, please tick the one box that best describes your answer.

1. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. The following questions are about activities you might do during a typical day. Does <u>your health now limit you</u> in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. <u>Moderate activities</u>, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐ 1	☐ 2	☐ 3
b. Climbing <u>several</u> flights of stairs	☐ 1	☐ 2	☐ 3

3. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Accomplished less than you would like	☐1	☐2	☐3	☐4	☐5
b. Were limited in the kind of work or other activities	☐1	☐2	☐3	☐4	☐5

4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Accomplished less than you would like	☐1	☐2	☐3	☐4	☐5
b. Did work or other activities less carefully than usual	☐1	☐2	☐3	☐4	☐5

5. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐1	☐2	☐3	☐4	☐5

6. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
c. Have you felt calm and peaceful?	☐1	☐2	☐3	☐4	☐5
d. Did you have a lot of energy?	☐1	☐2	☐3	☐4	☐5
e. Have you felt downhearted and low?	☐1	☐2	☐3	☐4	☐5

7. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐1	☐2	☐3	☐4	☐5

Thank you for completing these questions!

THE BARTHEL INDEX

Instructions:
Choose the scoring point for the statement that most closely corresponds to the patient's current level of ability for each of the following 10 items. Record actual, not potential, functioning. Information can be obtained from the patient's self-report, from a separate party who is familiar with the patient's abilities (such as a relative), or from observation. Refer to the Guidelines section on the following page for detailed information on scoring and interpretation.

Bowels
0 = incontinent (or needs to be given enemata)
1 = occasional accident (once/week)
2 = continent
Patient's Score: .....

Bladder
0 = incontinent, or catheterized and unable to manage
1 = occasional accident (max. once per 24 hours)
2 = continent (for over 7 days)
Patient's Score: .....

Grooming
0 = needs help with personal care
1 = independent face/hair/teeth/shaving (implements provided)
Patient's Score: .....

Toilet use
0 = dependent
1 = needs some help, but can do something alone
2 = independent (on and off, dressing, wiping)
Patient's Score: .....

Feeding
0 = unable
1 = needs help cutting, spreading butter, etc.
2 = independent (food provided within reach)
Patient's Score: .....

(Collins et al., 1988)

Transfer
0 = unable - no sitting balance
1 = major help (one or two people, physical), can sit
2 = minor help (verbal or physical)
3 = independent
Patient's Score: .....

Mobility
0 = immobile
1 = wheelchair independent, including corners, etc.
2 = walks with help of one person (verbal or physical)
3 = independent (but may use any aid, e.g., stick)
Patient's Score: .....

Dressing
0 = dependent
1 = needs help, but can do about half unaided
2 = independent (including buttons, zips, laces, etc.)
Patient's Score: .....

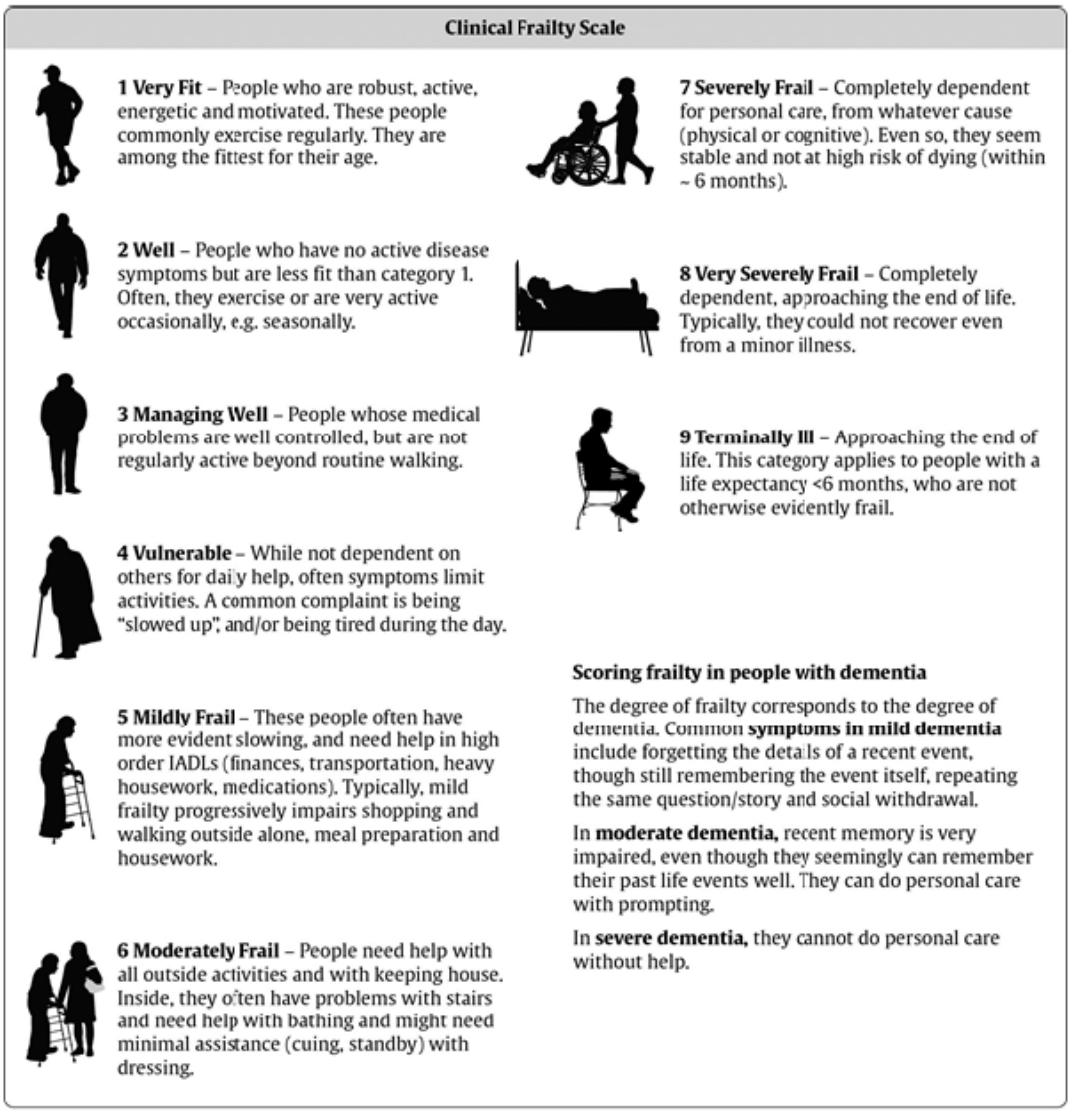
Stairs
0 = unable
1 = needs help (verbal, physical, carrying aid)
2 = independent up and down
Patient's Score: .....

Bathing
0 = dependent
1 = independent (or in shower)
Patient's Score: .....

TOTAL SCORE: .....

Scoring:
Sum the patient's scores for each item. Total possible scores range from 0 – 20, with lower scores indicating increased disability. If used to measure improvement after rehabilitation, changes of more than two points in the total score reflect a probable genuine change, and change on one item from fully dependent to independent is also likely to be reliable.

Clinical Frailty Scale



DEMOGRAPHIC QUESTIONNAIRE

Admission date: .....**Type of admission:**.....

Admitting hospital: ..... **Admitting Ward:**.....

Gender
Male ○ Female ○

Marital status
Married ○ Civil Partnership ○ Divorced ○ Single ○ Widowed ○ Separated ○ Member of unmarried couple ○ Prefer not to say ○

Employment status
Employed for wages ○ Self-employed ○ Retired ○ Student ○ Military ○
Out of work / looking for work ○ Out of work / not currently looking for work ○ Volunteer ○
Homemaker ○ Unable to work ○ Other ○ Prefer not to say ○

Does the patient live alone?
Yes ○ No ○ Unknown ○

Type of residence
Private residence - own home ○ Private residence – other ○ Supported accommodation ○
Nursing home ○ Hospice ○ Other ○

Type of property
Ground floor property / no stairs ○ Ground floor property / stairs at entrance ○
Property on the first floor or above accessed by stairs only ○
Property on the first floor or above with stairs or lift access ○ Prefer not to say ○

Ethnic background
White ○ Mixed or multiple ethnic groups ○ African, Caribbean or Black ○ Asian ○
Other ethnic group ○ Prefer not to say ○ Unknown ○

Religion
Christian (inc. Church of Scotland, Catholic, Protestant and other denominations) ○ Buddhist ○
Hindu ○ Jewish ○ Muslim ○ Sikh ○ No religion ○ Other ○ Prefer not to say ○
Unknown ○

Patient currently participates in other study: Yes ○ No ○

Reason for current admission: .....

Current diagnosis: .....

Past medical history / comorbidity: .....

.....

.....

.....

CARE PACKAGE SUMMARY SHEET

Was the patient receiving services/support prior to admission? Yes ○ No ○ Don't Know ○

Is there an unpaid carer? Yes ○ No ○ Don't Know ○

Is there a funded community service/care package in place on discharge? Yes ○ No ○

SERVICE	TEAM	CONTACT NAME	CONTACT NO.
i.e. Reablement	*North East*	*Veronica Houston*	*553 2121*
Reablement			
Intermediate Care			
Homecare			
Care at Home			
Other			

CARE TIMETABLE:

On discharge ○ / After ..... weeks ○ (Provider: .....)

Detail all help and support/services (Health Service, Social Work and/or the voluntary and private sectors) and times where possible.

If there is no help, tick here ○

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Service required?	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Time slot	7:30 – 11:30	11:30 – 16:30	16:30 – 20:00		20:00 – 22:00	22:00 – 7:30	
Preferred time							
Reason							
Length of time (mins)							
No. of carers							

What are the benefits of taking part?

The questionnaire will increase our awareness of what supports older people to bounce back after a difficult time in their life.

We hope that this will help us better understand the needs of older people and improve the support that older people receive in the future.

What are the disadvantages of taking part?

It is not thought that there are any disadvantages to taking part.

For independent advice about taking part in this research please contact:

Dr Susan Shenkin

Email: Susan.Shenkin@nhslothian.scot.nhs.uk

If you have any questions or complaints in relation to this research, please contact:

Professor Kirsty Forsyth (Principal Investigator)

Queen Margaret University Edinburgh

Tel: 0131 474 0000

Email: kforsyth@qmu.ac.uk

Thank you!

being able to spring back after a difficult time in your life

Making it CLEAR aims to support older people to bounce back from difficult times in their lives.

We have developed a questionnaire to help us understand how you feel about your resilience. It asks questions about your health, abilities, social life, community and the type of person you are.

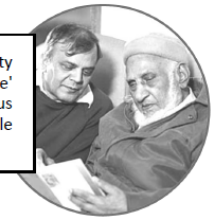
Queen Margaret University EDINBURGH

NHS Lothian

Date: 31/05/2018; v.4.0

making it CLEAR

Making it CLEAR - 'community living, enablement and resilience' is a questionnaire which helps us to understand how older people feel about their resilience.



What is the purpose of Making it CLEAR?

We are currently testing the questionnaire about resilience that we have developed. After the test, the questionnaire will be used with older people to help plan support in the community.

As part of the study we aim to learn what needs to be in place in the community to help older people bounce back. We will also use the information given by you for further research and education.

Do I have to take part?

If you're over 65, we would be very grateful if you could take the time to fill in this study package and consent form.

It's up to you to choose whether you want to take part and you are free to change your mind any time, without giving a reason.

If you choose not to take part, your hospital care will continue as normal.

What will happen if I agree to take part?

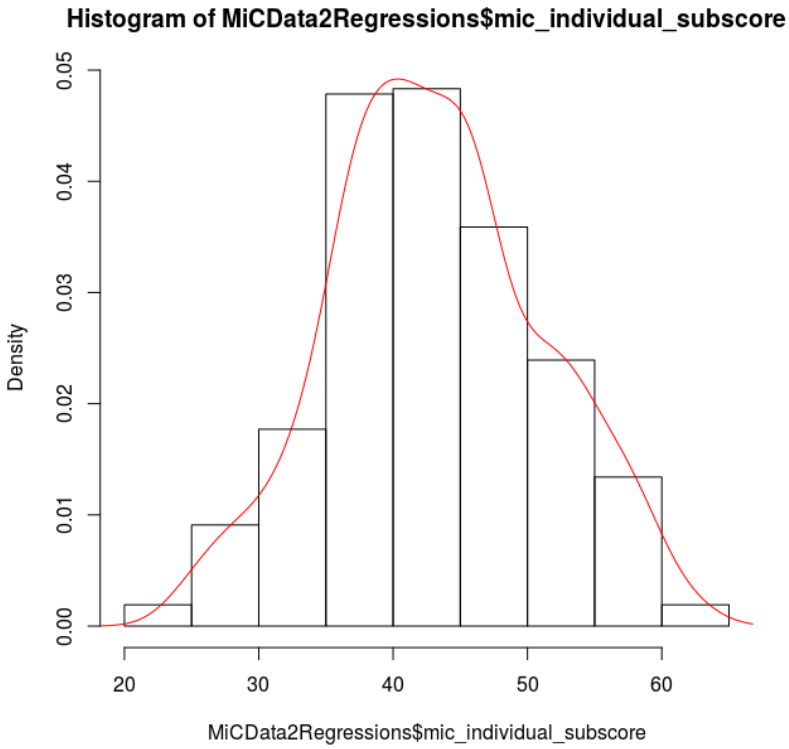
If you are happy with the explanations in the leaflet and would like to take part, we will inform your clinical team that you agreed to participate in the study.

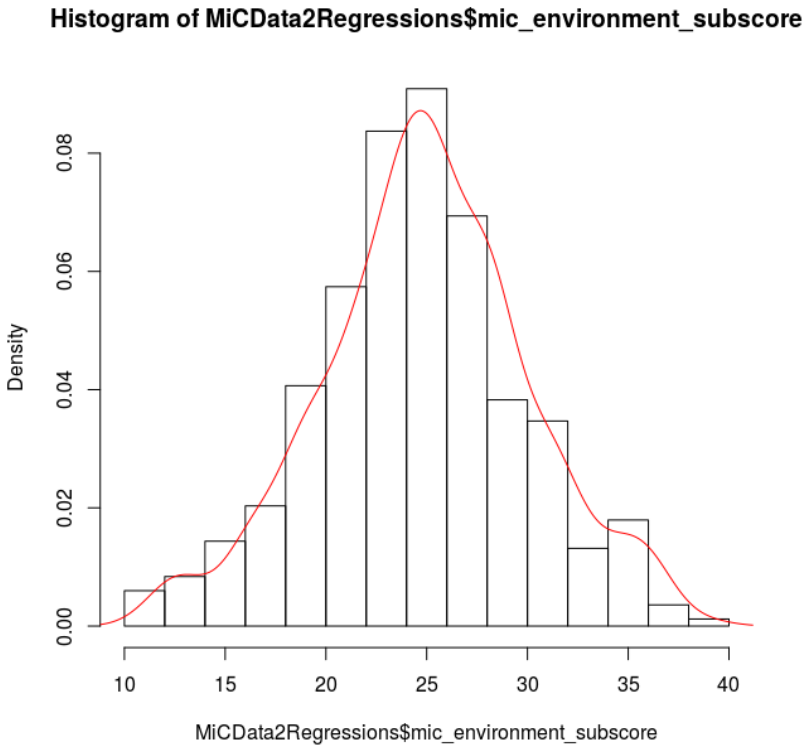
We request that you sign the consent form and then fill in the questionnaire package. A research practitioner will offer assistance to fill in the questionnaires, if needed.

Any information you give us will be kept in the strictest confidence and will be stored securely. Only the team who are working on the project will see your answers. Names, addresses and any information that may identify you will be removed from any presented results.

However, if you share information about a criminal or other issue related to your or others' safety, the research practitioner will have to share this information with your clinical team and with Professor Forsyth at Queen Margaret University, who oversees this study.

Appendix 13 - Histogram of IDoR and EDoR subscale scores





Appendix 14 - Data cleaning and Quality report for the original study dataset

The original dataset consists of data from 421 participants with 129 variables.

Data cleaning consisted of three stages:

1. Identification of data entry errors
2. 10% quality assurance test 1
3. 10% quality assurance test 2

Identification of data entry errors

During data collection the researcher became aware of errors that had been made during data entry. They are summarised in the table below. These errors were corrected before the first quality assurance test.

Participant no	Data entry error
034	Missing item entry from MiC questionnaire
075	Missing item entry from MiC questionnaire
082	Missing item entry from Optum SF-12v2 Health Survey
101	Missing data entry regarding Package of Care scheduled start
148	Missing item entry from MiC questionnaire
264	Incorrect entry of postcode
313	Missing data entry regarding d/c destination and Package of Care details
316	Incorrect entry of whether they live alone
338	Incorrect entry of whether they live alone
362	Missing data entry regarding Package of Care scheduled start

10% quality assurance test 1

An online random number generator was used to randomly select 10% of the records. The paper records were then checked against their entries in the electronic database.

During this test the following errors were noted:

- One participant's DOB had been entered incorrectly, with the year of recruitment included rather than the year of their Barthel birth.
- In a couple of records a stroke diagnosis had been classed as a condition of the nervous system, rather than the cardiovascular system.

In response the coding for all participants past medically history was double checked, and corrected where necessary. Additionally, all participant's DOBs were checked for errors; this error had not been made elsewhere in the dataset.

10% quality assurance test 2

Again, an online random number generator was used to randomly select 10% of the records. The paper records were then checked against their entries in the electronic database. During this test there were no disparities found between the paper records and the entries in the electronic database.

The cleaned dataset was then quality assessed considering the six core data quality dimensions of:

4. Completeness
5. Uniqueness
6. Timeliness
7. Validity
8. Accuracy
9. Consistency

(Centers for Disease Control and Prevention (CDC) 2019)

Completeness

Definition: The proportion of stored data against the potential of '100% complete'. (CDC 2019)

The dataset was 99.13% complete, in total there were 454 missing values. This missingness was observed in 4 areas:

Completing of patient-reported measures:

In total three participants refused to complete the measures, this accounted for around 19% of the missing values. Reasons given for lack of completion are listed in the table below.

Participant no	Reason
006	Did not complete with arrival of transport
078	Did not complete with fatigue, having moved up to the ward in the middle of the night.
223	Refused to answer more questions after the MiC questionnaire

Packages of Care:

Of 421 participants, 271 were discharged with a package of care.

For 55 participants their service providers name was not available to the researcher; and for 224 details about a specific care team, within the service provider, was not available.

This missing data accounted for around 61.5% of missing values.

Scottish Index of Multiple Deprivation:

Data from the SIMD was not available for 6 participants:

- Four of these resided in a Nursing Home (3 of these resided in the same Home)
- One lived in supported accommodation
- One lived in their own home, but this was in England.

This missing data accounted for around 14.5% of missing values.

Clinical Frailty Scale:

The Clinical frailty scale was not completed for the first 21 participants (001-021).

This was with it not being routinely completed during their hospital stay, as pre-data collection information gathering had suggested it would be. Following the 21st participant it was decided that the researcher would ask a member of the medical staff to complete it.

This missing data accounted for around 4.6% of missing values.

Uniqueness

Definition: Nothing will be recorded more than once based upon how that thing is identified. (CDC 2019)

There was only potential for data items to be duplicated where they pertained to a participants' package of care.

The three items titled 'Care Package at Discharge' (CP_Discharge), 'Time of PoC onset' (PoC_Care_Onset) and 'Is a PoC required?' (PoC_HC_required) would contain duplicate values if a participant were to not need a PoC, as all data would be coded 0 for 'no'.

However, the three items were required with the range of potential responses to these items.

For example, if a participant were to need a PoC, but they were going to wait for it in the community for an indeterminate amount of time, the coding would be as follows:

CP_Discharge: 0

PoC_Care_Onset: 3

PoC_HC_required: 1

Timeliness

Definition: The degree to which data represent reality from the required point in time. (CDC 2019)

Participants were required to be fit for discharge at the time of recruitment. On average the time between data collection and hospital discharge was 2 days; this ranged from 0 days (that is, they were recruited on the day of discharge) and 22 days. Where there was a substantial delay between recruitment and discharge comments were recorded on the dataset to explain for the delay; in general they either related to discharge arrangements (e.g. the participant's PoC had closed) or ill health.

For all participants, all measures, both patient-reported and researcher-completed, were completed on the same day.

Validity

Definition: Data are valid if it conforms to the syntax (format, type, range) of its definition. (CDC 2019)

Validity applies at the data item level, and the record level.

At the data item level all data were collected following the study protocol and coded in line with the supplied MiC for MoE Validation: Code Book (v5.0).

At record level, for every participant, the recorded date of discharge was later than the date of admission, and the date questionnaires were completed was either earlier or the same as the date of discharge.

Accuracy

Definition: The degree to which appear to be free from significant errors. (Yue, Kerner and Stone, 2015)

A 10% quality assurance checked the accuracy with which paper copies had been recorded into the electronic database. Comparing the database with an authoritative reference data set, generated by NHS Lothian Analytical Services, showed that data pertaining to participants' admission and discharge (e.g. dates, diagnoses) were entered accurately.

Otherwise, data collected using the Making it CLEAR questionnaire, the Optum SF-12v2 - Health Survey and the Barthel Index - were recorded as individual items, subscale scores (MiC questionnaire only), and total scores. There was consistency across these fields, with subscale scores and total scores being auto-computed based on the individual item results.

Consistency

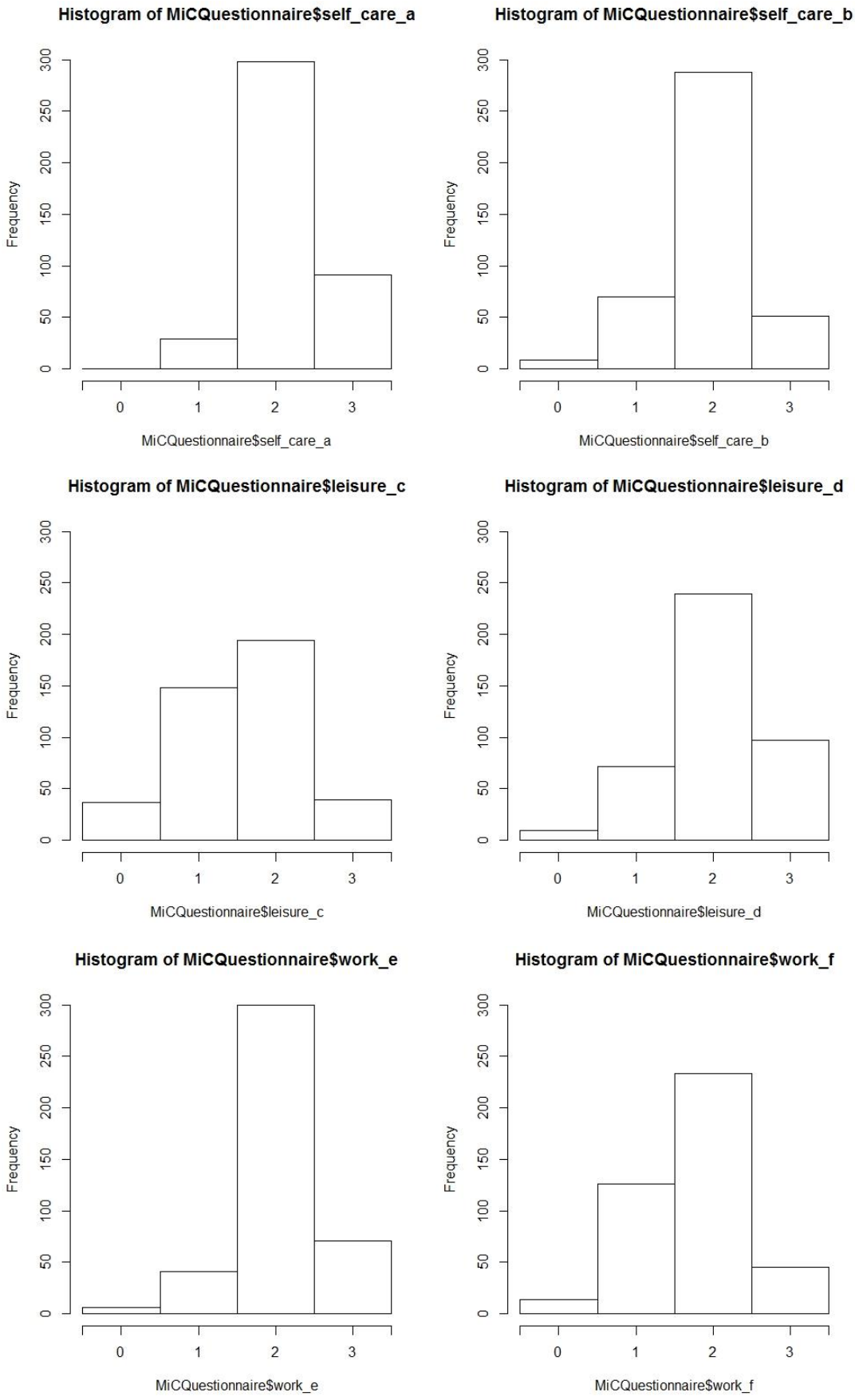
Definition: The extent to which data are collected using the same procedures and definitions across collectors and sites over time (Yue et al. 2015).

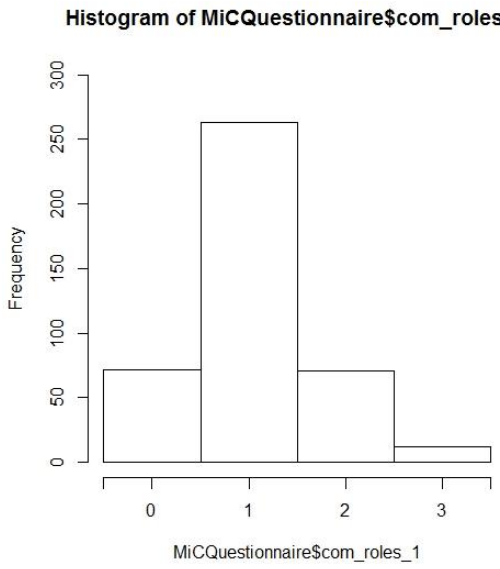
Participants were recruited, data were collected, and coding was completed by one researcher at one location for a 13 month period. When this researcher was on leave data collection was covered by a single member of the research team who was familiar with the required procedures having been involved with the writing of the research protocol, and was present for the first two weeks of data collection. These two researchers were the sole individuals to recruit participants, and collect and code data.

In relation to the data collected, it was pre-determined that participant's CHI numbers would be collected to link baseline data with readmission data. However, for two participants UHPI numbers had to be taken instead as they were on holiday in Scotland and so their CHI numbers were not available.

Appendix 15 - IDoR polychoric correlation matrix

	a	b	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	**KMO**
self_care_a	1																					0.90
self_care_b	0.51	1																				0.92
ind_patient_10	0.26	0.08	1																			0.90
ind_accept_11	0.29	0.27	0.39	1																		0.91
ind_forgive_12	0.27	0.15	0.43	0.45	1																	0.93
ind_lookforward_13	0.32	0.32	0.28	0.44	0.39	1																0.94
ind_funny_14	0.45	0.32	0.29	0.47	0.39	0.56	1															0.91
ind_principles_15	0.35	0.23	0.20	0.29	0.37	0.37	0.30	1														0.93
ind_past_16	0.38	0.24	0.27	0.37	0.42	0.38	0.44	0.45	1													0.94
ind_help_17	0.32	0.25	0.27	0.36	0.44	0.38	0.39	0.40	0.44	1												0.93
ind_happy_18	0.42	0.31	0.39	0.49	0.53	0.57	0.62	0.42	0.45	0.50	1											0.91
ind_realities_19	0.36	0.19	0.29	0.39	0.42	0.33	0.40	0.42	0.44	0.36	0.42	1										0.95
ind_health_20	0.23	0.26	0.26	0.32	0.23	0.34	0.24	0.21	0.14	0.13	0.34	0.23	1									0.91
ind_able_21	0.45	0.50	0.14	0.26	0.18	0.40	0.38	0.34	0.28	0.35	0.31	0.26	0.48	1								0.86
ind_control_22	0.43	0.41	0.34	0.49	0.33	0.47	0.41	0.25	0.28	0.39	0.52	0.29	0.46	0.60	1							0.94
ind_physable_23	0.36	0.44	0.17	0.38	0.20	0.38	0.36	0.27	0.23	0.24	0.38	0.29	0.51	0.69	0.60	1						0.91
ind_energy_24	0.36	0.42	0.20	0.51	0.25	0.41	0.37	0.25	0.18	0.24	0.37	0.25	0.51	0.61	0.56	0.68	1					0.91
ind_talk_25	0.41	0.33	0.17	0.34	0.26	0.34	0.44	0.27	0.28	0.41	0.50	0.27	0.23	0.45	0.46	0.36	0.34	1				0.90
ind_getalong_26	0.25	0.22	0.30	0.41	0.39	0.49	0.40	0.41	0.38	0.52	0.53	0.34	0.24	0.28	0.41	0.26	0.23	0.53	1			0.90
ind_concentrate_27	0.38	0.27	0.35	0.42	0.25	0.34	0.29	0.36	0.27	0.31	0.42	0.33	0.22	0.35	0.39	0.32	0.37	0.36	0.43	1		0.91
ind_identify_28	0.41	0.31	0.23	0.39	0.31	0.39	0.32	0.43	0.37	0.38	0.42	0.43	0.27	0.45	0.40	0.40	0.43	0.43	0.39	0.55	1	0.94


Histogram of MiCQuestionnaire$self_care_a
Frequency
MiCQuestionnaire$self_care_a
Histogram of MiCQuestionnaire$self_care_b
Frequency
MiCQuestionnaire$self_care_b
Histogram of MiCQuestionnaire$leisure_c
Frequency
MiCQuestionnaire$leisure_c
Histogram of MiCQuestionnaire$leisure_d
Frequency
MiCQuestionnaire$leisure_d
Histogram of MiCQuestionnaire$work_e
Frequency
MiCQuestionnaire$work_e
Histogram of MiCQuestionnaire$work_f
Frequency
MiCQuestionnaire$work_f


Histogram of MiCQuestionnaire$com_roles_1
Frequency
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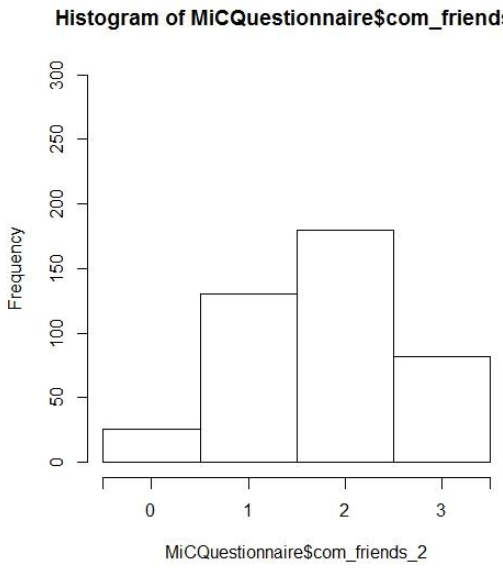
200
250
300
0
1
2
3
MiCQuestionnaire$com_roles_1


Histogram of MiCQuestionnaire$com_friends_2
Frequency
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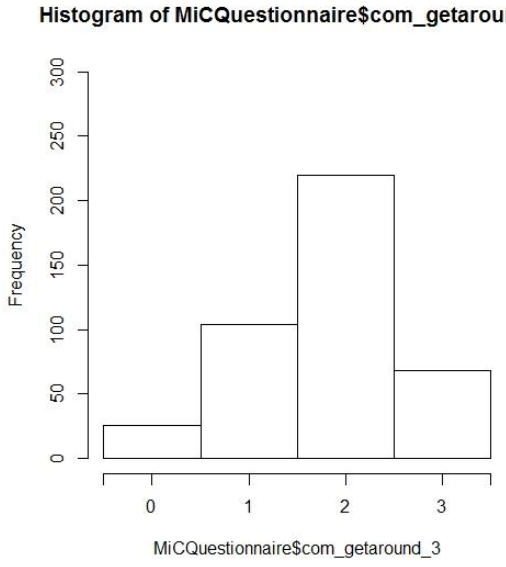
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_friends_2


Histogram of MiCQuestionnaire$com_getaround_3
Frequency
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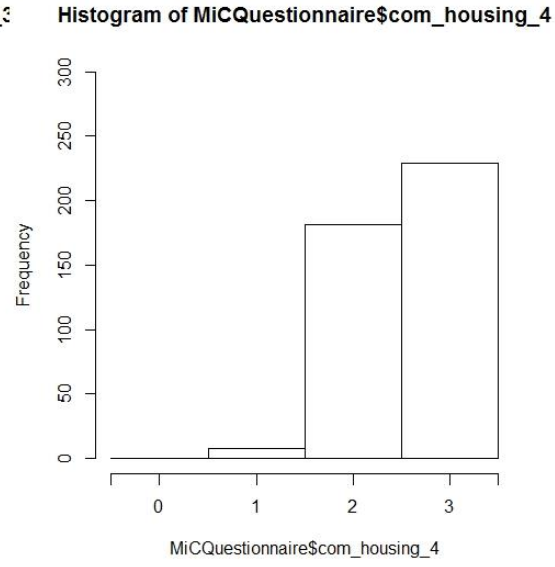
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_getaround_3


Histogram of MiCQuestionnaire$com_housing_4
Frequency
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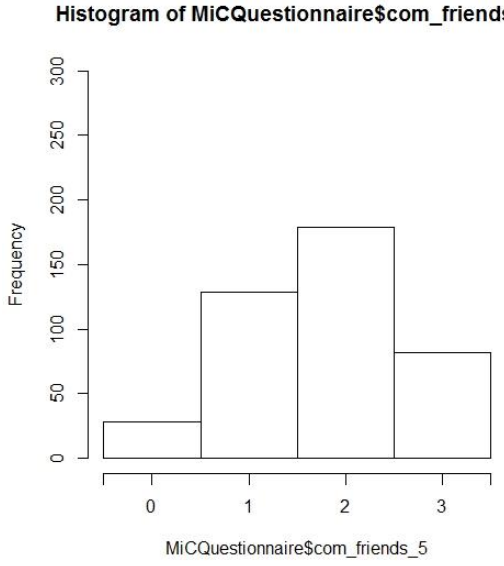
50
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_housing_4


Histogram of MiCQuestionnaire$com_friends_5
Frequency
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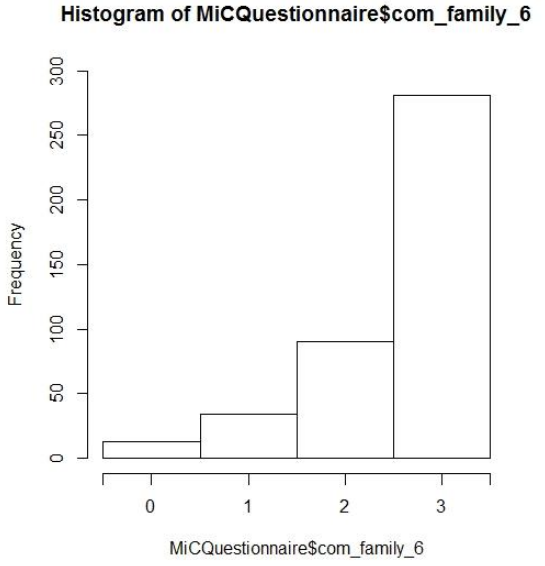
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_friends_5


Histogram of MiCQuestionnaire$com_family_6
Frequency
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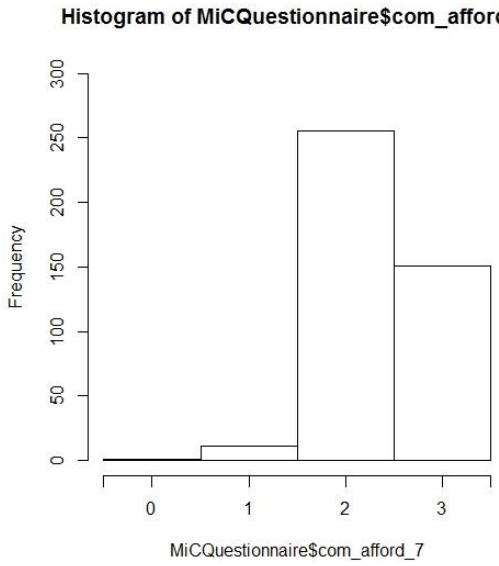
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_family_6


Histogram of MiCQuestionnaire$com_afford_7
Frequency
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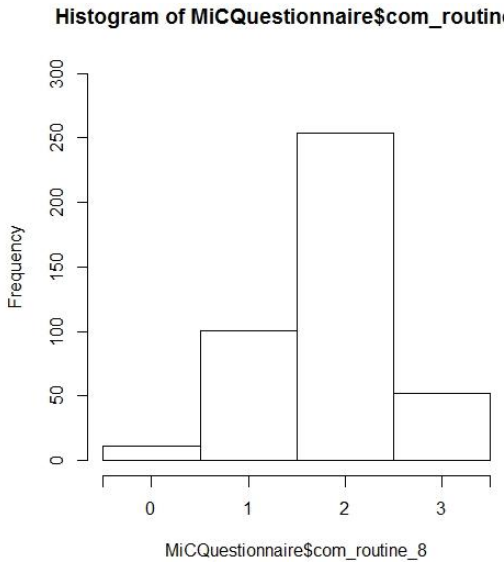
50
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_afford_7


Histogram of MiCQuestionnaire$com_routine_8
Frequency
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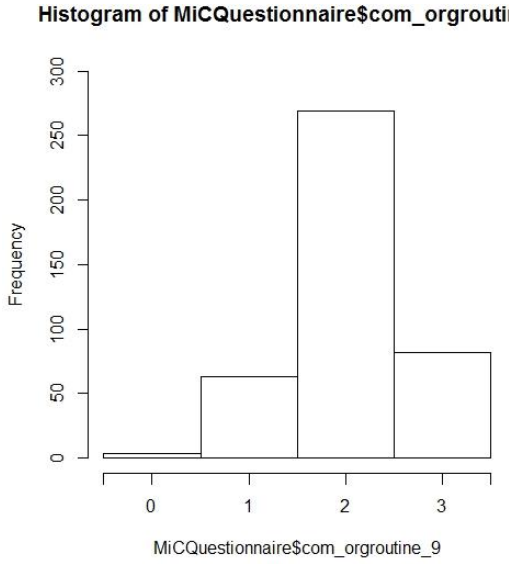
50
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_routine_8


Histogram of MiCQuestionnaire$com_orgroutine_9
Frequency
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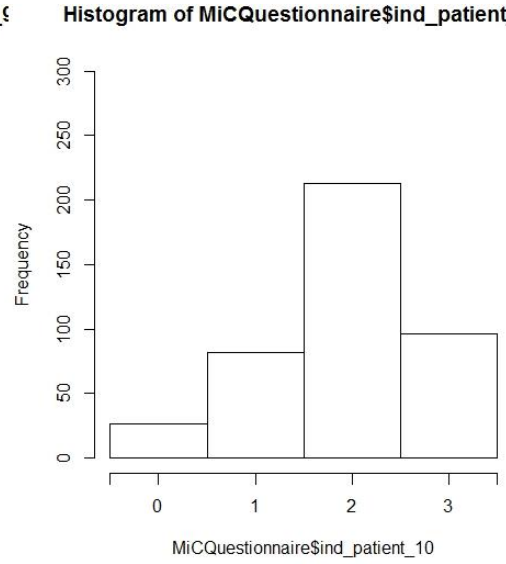
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$com_orgroutine_9


Histogram of MiCQuestionnaire$ind_patient_10
Frequency
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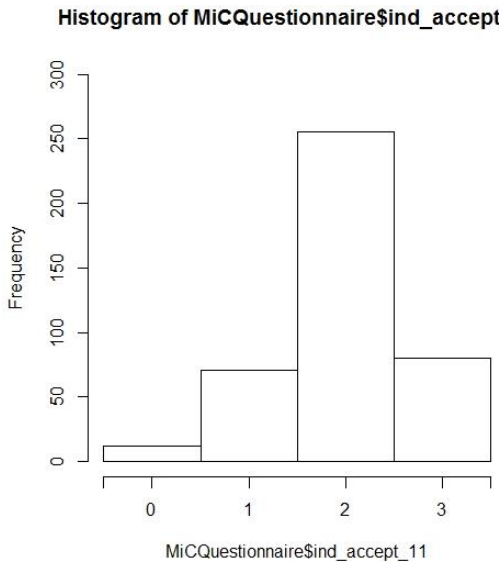
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_patient_10


Histogram of MiCQuestionnaire$ind_accept_11
Frequency
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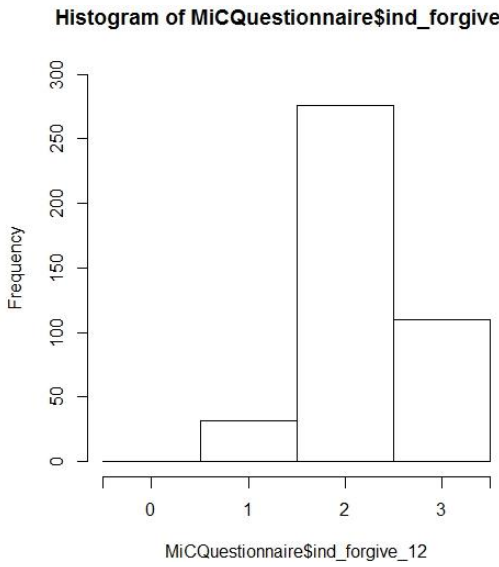
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_accept_11


Histogram of MiCQuestionnaire$ind_forgive_12
Frequency
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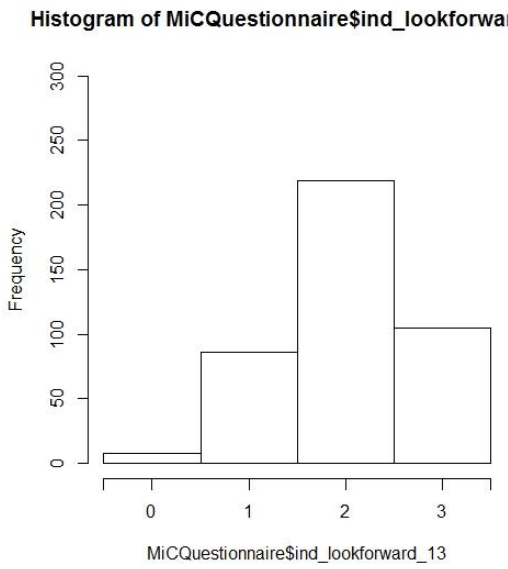
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_forgive_12


Histogram of MiCQuestionnaire$ind_lookforward_1
Frequency
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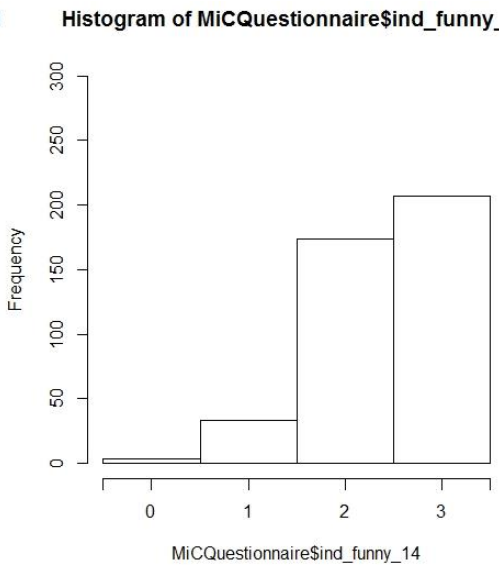
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_lookforward_13


Histogram of MiCQuestionnaire$ind_funny_14
Frequency
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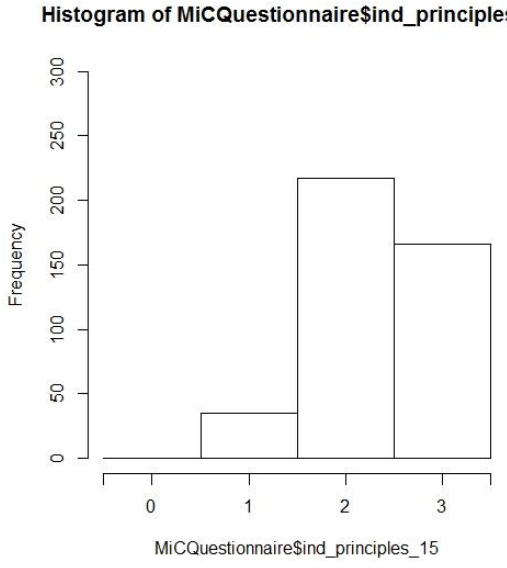
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_funny_14


Histogram of MiCQuestionnaire$ind_principles_15
Frequency
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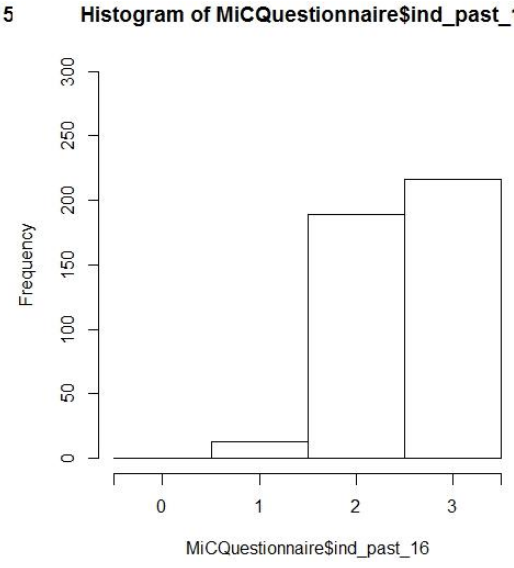
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_principles_15


Histogram of MiCQuestionnaire$ind_past_16
Frequency
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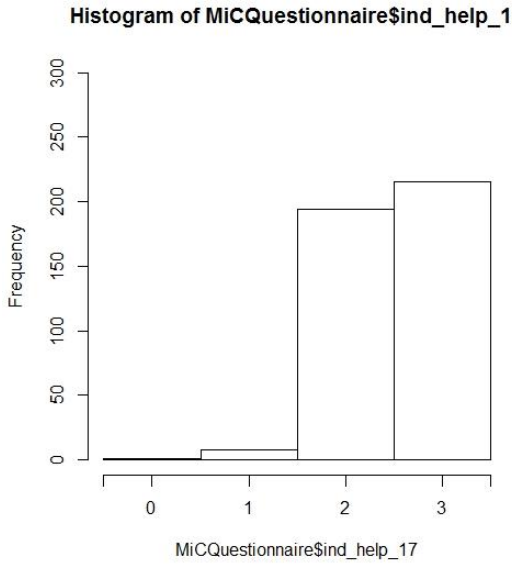
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_past_16


Histogram of MiCQuestionnaire$ind_help_17
Frequency
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100
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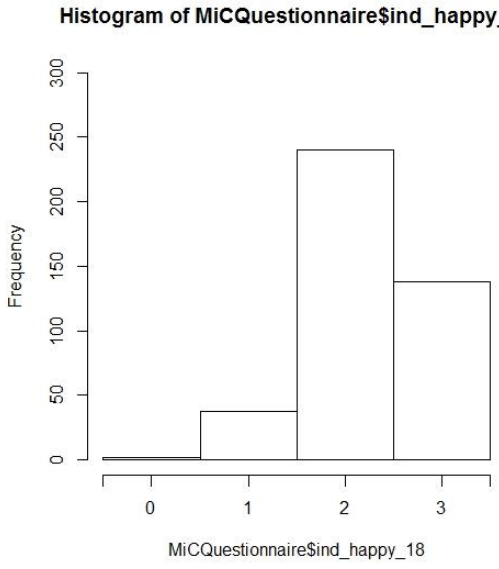
200
250
300
0
1
2
3
MiCQuestionnaire$ind_help_17


Histogram of MiCQuestionnaire$ind_happy_18
Frequency
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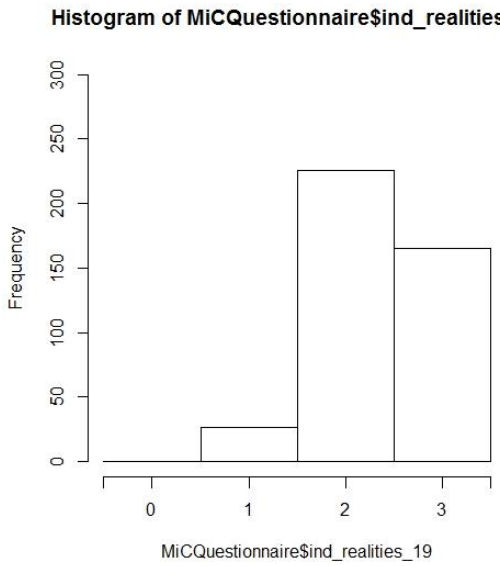
200
250
300
0
1
2
3
MiCQuestionnaire$ind_happy_18


Histogram of MiCQuestionnaire$ind_realities_19
Frequency
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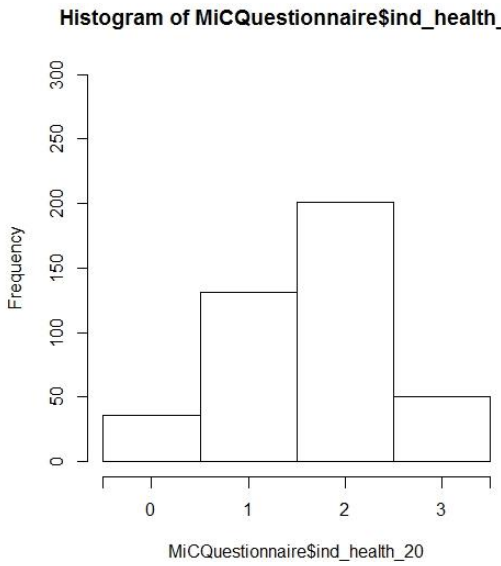
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_realities_19


Histogram of MiCQuestionnaire$ind_health_20
Frequency
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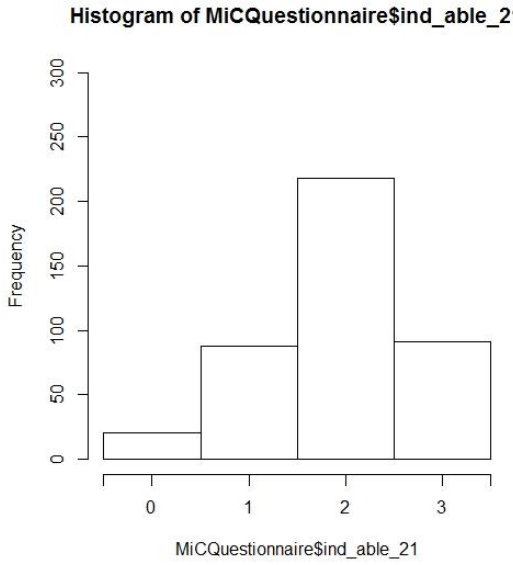
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_health_20


Histogram of MiCQuestionnaire$ind_able_21
Frequency
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100
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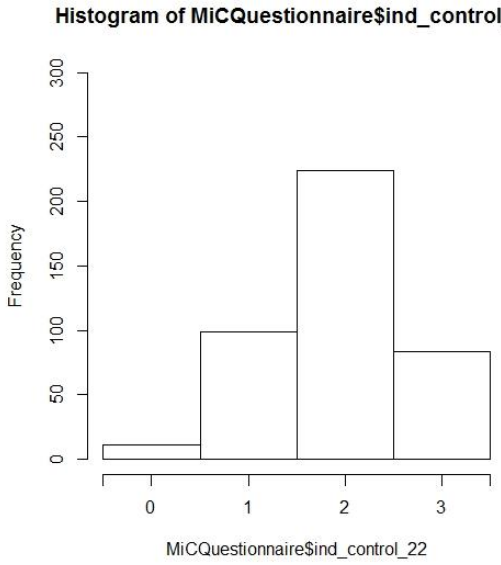
200
250
300
0
1
2
3
MiCQuestionnaire$ind_able_21


Histogram of MiCQuestionnaire$ind_control_22
Frequency
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250
300
0
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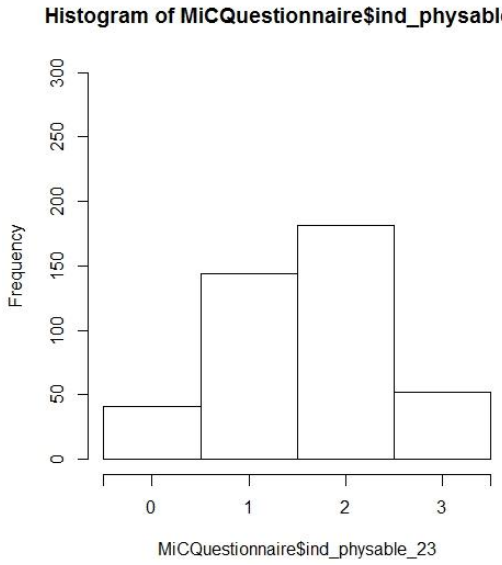
2
3
MiCQuestionnaire$ind_control_22


Histogram of MiCQuestionnaire$ind_physable_23
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250
300
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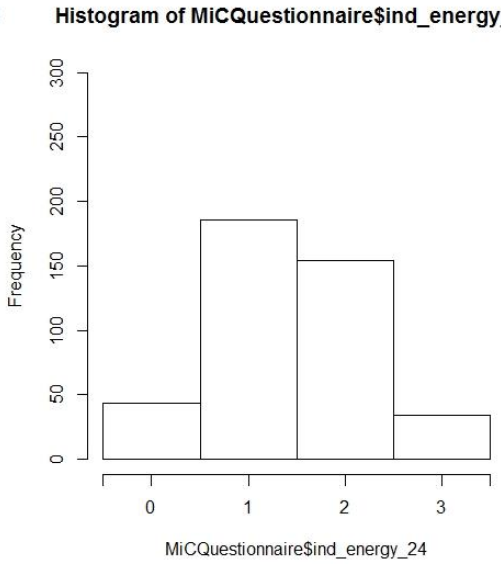
2
3
MiCQuestionnaire$ind_physable_23


Histogram of MiCQuestionnaire$ind_energy_24
Frequency
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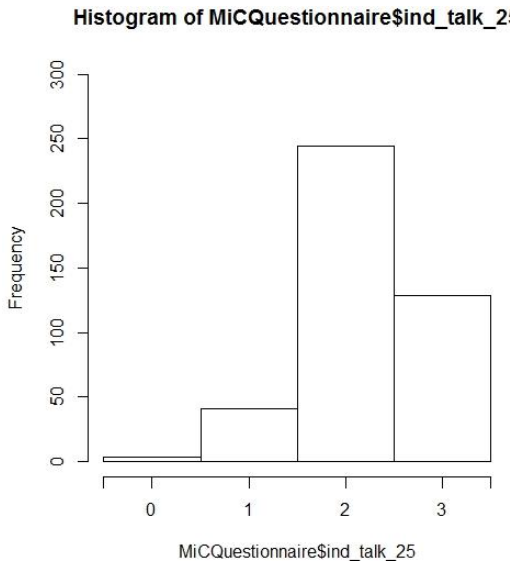
200
250
300
0
1
2
3
MiCQuestionnaire$ind_energy_24


Histogram of MiCQuestionnaire$ind_talk_25
Frequency
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100
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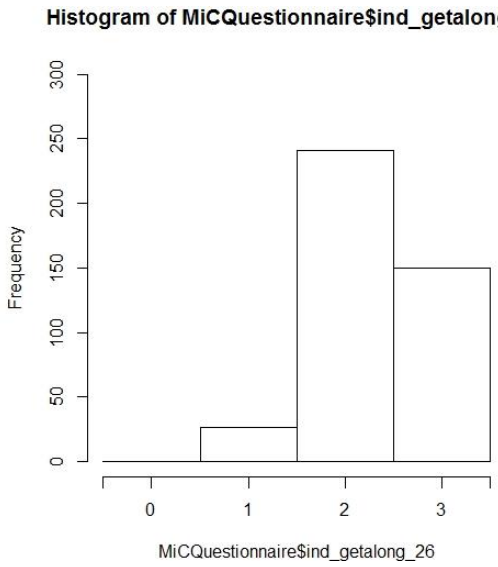
250
300
0
1
2
3
MiCQuestionnaire$ind_talk_25


Histogram of MiCQuestionnaire$ind_getalong_26
Frequency
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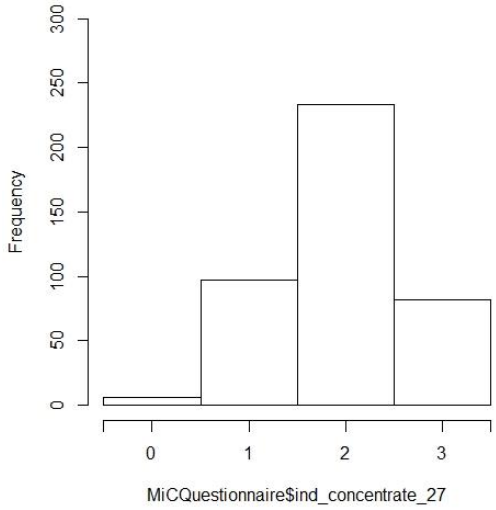
200
250
300
0
1
2
3
MiCQuestionnaire$ind_getalong_26


Histogram of MiCQuestionnaire$ind_concentrate_2
Frequency
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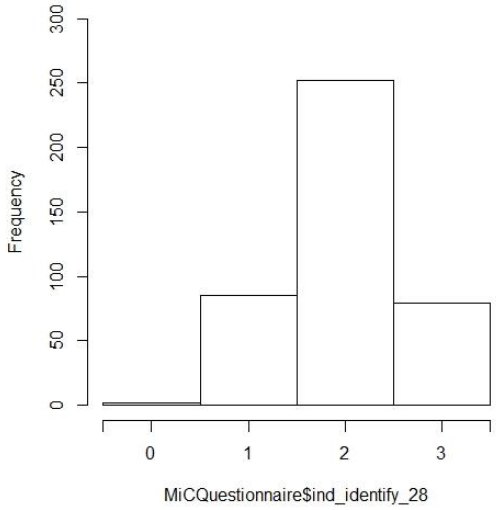
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_concentrate_27


Histogram of MiCQuestionnaire$ind_identify_28
Frequency
0
50
100
150
200
250
300
0
1
2
3
MiCQuestionnaire$ind_identify_28

Appendix 17 - EDoR polychoric correlation matrix

	c	d	e	f	1	2	3	4	5	6	7	8	9	**KMO**
leisure_c	1													0.86
leisure_d	0.58	1												0.88
work_e	0.28	0.42	1											0.90
work_f	0.48	0.52	0.38	1										0.90
com_roles_1	0.50	0.40	0.33	0.33	1									0.83
com_friends_2	0.46	0.48	0.26	0.34	0.48	1								0.77
com_getaround_3	0.40	0.52	0.37	0.37	0.26	0.26	1							0.93
com_housing_4	0.29	0.44	0.25	0.28	0.07	0.32	0.40	1						0.89
com_friends_5	0.36	0.48	0.29	0.37	0.40	0.77	0.28	0.32	1					0.77
com_family_6	0.14	0.39	0.14	0.05	0.09	0.22	0.16	0.29	0.13	1				0.69
com_afford_7	0.12	0.36	0.23	0.23	0.00	0.19	0.26	0.43	0.21	0.19	1			0.87
com_routine_8	0.35	0.44	0.32	0.26	0.21	0.30	0.42	0.33	0.30	0.26	0.31	1		0.80
com_orgroutine_9	0.41	0.55	0.44	0.40	0.18	0.37	0.50	0.48	0.37	0.23	0.39	0.72	1	0.82

Appendix 18 - Categorical variable response counts

VARIABLE	CATEGORIES						
TYPE OF ADMISSION							
	Emergency	**Elective**					
Type of admission	417	1					
DEMOGRAPHICS							
	Male	**Female**					
Gender	136	282					
	Married	**Civil Partnership**	**Divorced**	**Separated**	**Single**	**Widowed**	**Never married**
Marital Status	87	0	27	10	19	270	5
	Retired	**Homemaker**	**Employed**				
Employment	391	26	1				
	Christian	**No Religion**	**Other**	**Refused to answer**			
Religion	231	164	18	5			
	White	**Mixed Race**	**Black**	**Asian**			
Ethnicity	415	1	1	1			
	Yes	**No**					
Live alone	292	126					
	Own home	**Other private accommodation**	**Supported accommodation**	**Nursing Home**			
Residence location	242	87	80	9			
	Ground floor, no stairs	**Ground floor, stairs**	**First floor or above, stairs**	**First floor or above, lift**			

Accommodation type	75	226	62	55

REASON FOR ADMISSION		
	Yes	**No**
Admitted with a fall	180	238
Admitted with functional decline	56	362
Admitted with a fracture	4	414
Admitted with chest pain	24	394
Admitted with shortness of breath	63	355
Admitted with nausea	49	369
Admitted with a head injury	23	395
Admitted with a stroke	410	8
Admitted with an infection	21	397
Admitted with confusion	72	346
Admitted with loss of consciousness	23	395
Admitted with another injury	43	375

Admitted with another illness	97	321	
	1	**2**	**3**
Total number of reasons for admission	206	179	33
DIAGNOSIS ON ADMISSION			
	Yes	**No**	
Diagnosed with a respiratory condition	131	287	
Diagnosed with a condition of the endocrine system	11	407	
Diagnosed with a condition of the circulatory system	94	324	
Diagnosed with an eye condition	1	417	
Diagnosed with a condition of the nervous system	12	406	
Diagnosed with a musculoskeletal condition	55	363	
Diagnosed with a tumour	5	413	

Diagnosed with a mental health condition	5	413
Diagnosed with a skin condition	35	383
Diagnosed with condition of digestive system	45	373
Diagnosed with a condition of the genitourinary system	114	304
Diagnosed with an 'other' condition	26	392
Diagnosed with delirium	88	380
Diagnosed as having a fall	98	320
Diagnosed with dementia	2	416

	1	**2**	**3**
Number of conditions the patient was diagnosed with	172	188	58

PAST MEDICAL HISTORY

	Yes	No
Past medical history of respiratory condition	124	294
Past medical history of an endocrine condition	130	288
Past medical history of a circulatory condition	360	58
Past medical history of eye condition	97	321
Past medical history of a nervous system condition	114	304
Past medical history of a musculoskeletal condition	242	176
Past medical history of a tumour	86	332

Past medical history of a mental health condition	74	344
Past medical history of a skin condition	72	346
Past medical history of a digestive condition	184	234
Past medical history of a genitourinary condition	163	255
Past medical history of a cognitive impairment	106	312
Past medical history of an 'other' condition	76	342

BARTHEL INDEX			
	Incontinent	**Occasional Accident**	**Continent**
Barthel Index - bowels	19	34	365

Barthel Index - bladder	95	67	256					
	Dependent	**Requires Help**	**Independent**					
Barthel Index - grooming	138	-	280					
Barthel Index - toilet use	21	57	340					
Barthel Index - feeding	10	14	394					
Barthel Index - dressing	30	208	180					
Barthel Index - stairs	214	106	98					
Barthel Index - bathing	257	-	161					
	Unable	**Major Help**	**Minor Help**	**Independent**				
Barthel Index - transfer	1	20	26	371				
	Immobile	**Wheelchair User**	**Help**	**Independent**				
Barthel Index - mobility	12	7	35	364				
CLINICAL FRAILTY SCALE								
	Very fit	**Well**	**Managing well**	**Vulnerable**	**Mildly Frail**	**Moderately Frail**	**Severely Frail**	**Very Severely Frail**
CFS score	0	3	9	59	121	190	33	3

PACKAGE OF CARE DETAILS								
	Yes	**No**						
PoC before admission	207	211						
Informal carer before admission	141	277						
	Yes	**No**	**To be determined during intermediate care**					
Is a PoC required?	279	133	6					
	Yes-funded	**Yes-private**	**No**					
PoC on discharge	259	9	150					
	No PoC	**On discharged**	**After defined time lapse**	**After undefined time lapse**	**After Intermediate care**			
PoC onset	133	248	5	22	10			
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Number of days PoC provided	148	1	3	5	0	2	0	259
How many times a day is PoC provided?	148	31	93	61	80	5	-	-
Number of carers at each PoC visits	148	259	11	-	-	-	-	-

		IDoR SUBSCALE		EDoR SUBSCALE	
VARIABLE	**TEST**	**RESULT**	**P VALUE**	**RESULT**	**P VALUE**
Length between admission and recruitment	Spearmans correlation	-0.05	0.31	-0.002	0.96
SIMD overall rank	Spearmans correlation	-0.08	0.12	-0.019	0.7
SIMD quintile rank	ANOVA	0.8	0.52	0.2	0.94
Age	Pearsons correlation	0.002	0.96	-0.016	0.75
Gender	T-test	-1.48	0.14	-1.17	0.24
Marital status	ANOVA	2.16	0.09	0.75	0.52
Lives alone	T-test	-0.82	0.42	-0.48	0.63
Residence location	ANOVA	0.56	0.64	0.5	0.68
Accommodation type	ANOVA	0.17	0.92	0.75	0.52
Religion	ANOVA	2.38	0.09	7.72	0.0051
Admitted following a fall	T-test	0.95	0.34	1.97	0.05
Admitted with functional decline	T-test	0.57	0.57	1.22	0.23
Admitted with chest pain	T-test	-0.28	0.78	-0.25	0.8
Admitted with shortness of breath	T-test	-2.29	0.02	-1.99	0.05
Admitted with nausea	T-test	0.51	0.61	0.028	0.98
Admitted with head injury	T-test	1.16	0.26	1.41	0.17
Admitted with an infection	T-test	1.08	0.29	-1.45	0.16
Admitted with confusion	T-test	-0.16	0.87	-0.63	0.52
Admitted with LOC	T-test	-0.91	0.37	-1.14	0.27
Admitted with 'other injury'	T-test	1.58	0.12	1.12	0.27
Admitted with 'other illness'	T-test	-0.69	0.49	-1.04	0.3
Number of reasons for admission	ANOVA	0.68	0.51	0.1	0.9

Diagnosed with a respiratory condition	T-test	-1.22	0.22	-0.48	0.63
Diagnosed with a condition of the circulatory system	T-test	-0.06	0.96	-1.96	0.052
Diagnosed with a musculoskeletal condition	T-test	-0.15	0.88	0.22	0.83
Diagnosed with a skin condition	T-test	0.84	0.4	-0.98	0.33
Diagnosed with condition of digestive system	T-test	1.98	0.05	2.12	0.037
Diagnosed with a condition of the genitourinary system	T-test	-0.33	0.74	0.22	0.82
Diagnosed with an 'other' condition	T-test	0.87	0.39	0.17	0.87
Diagnosed with delirium	T-test	0.6	0.55	-0.24	0.81
Diagnosed as having a fall	T-test	0.18	0.86	2.05	0.04
Number of conditions the patient was diagnosed with	ANOVA	3.24	0.04	0.75	0.48
Past medical history of respiratory condition	T-test	-1.2	0.23	-1.1	0.27
Past medical history of an endocrine condition	T-test	-0.29	0.77	0.2	0.84
Past medical history of a circulatory condition	T-test	1.45	0.15	1.27	0.21
Past medical history of eye condition	T-test	2.17	0.03	2.79	0.006
Past medical history of a nervous system condition	T-test	0.31	0.76	0.9	0.37
Past medical history of a musculoskeletal condition	T-test	0.3	0.77	-0.05	0.96
Past medical history of a tumour	T-test	0.76	0.45	-1.64	0.1

Past medical history of a mental health condition	T-test	2.7	0.008	2.01	0.047
Past medical history of a skin condition	T-test	-0.83	0.41	-0.46	0.65
Past medical history of a digestive condition	T-test	0.61	0.55	1.65	0.1
Past medical history of a genitourinary condition	T-test	1.58	0.12	0.31	0.76
Past medical history of a cognitive impairment	T-test	0.24	0.81	-0.28	0.78
Past medical history of an 'other' condition	T-test	1.2	0.23	1.27	0.21
Number of past medical conditions	ANOVA	-1.1	0.03	-0.09	0.06
Barthel Index - bowels	ANOVA	0.7	0.41	0.13	0.72
Barthel Index - bladder	ANOVA	4.1	0.02	2.05	0.13
Barthel Index - grooming	T-test	-4.59	$6.779e^{-6}$	3.64	0.0003
Barthel Index - toilet use	ANOVA	6.2	0.002	4.28	0.015
Barthel Index - feeding	ANOVA	6.48	0.01	3.09	0.08
Barthel Index - transfer	ANOVA	5.8	0.003	6.22	0.0022
Barthel Index - mobility	ANOVA	5.27	0.006	2.1	0.12
Barthel Index - dressing	ANOVA	15.12	$4.59e^{-7}$	10.33	$4.17e^{-5}$
Barthel Index - stairs	ANOVA	4.77	0.009	6.7	0.0014
Barthel Index - bathing	T-test	-5.44	$1.088e^{-7}$	5.63	$4.057e^{-8}$
Barthel Index - total	Spearmans correlation	0.24	$6.852e^{-7}$	0.24	$6.181e^{-7}$
CFS score	ANOVA	11.65	$5.64e^{-9}$	10.79	$2.48e^{-8}$
Optum SF-12v2 - PCS	Pearsons correlation	0.34	$1.153e^{-12}$	0.38	$1.024e^{-15}$
Optum SF-12v2 - MCS	Spearmans correlation	0.37	$8.067e^{-15}$	0.29	$1.813e^{-9}$
PoC before admission	T-test	3.7	0.0002	2.96	0.003
Informal carer before admission	T-test	-0.35	0.73	0.65	0.51
PoC on discharge	ANOVA	15.69	$8.76e^{-5}$	16.04	$7.35e^{-5}$
PoC onset	ANOVA	5.87	0.0006	5.45	0.001
Is a PoC required?	ANOVA	8.45	0.0003	7.96	0.0004

Number of days PoC provided	ANOVA	11.09	$2.04e^{-5}$	11.17	$1.89e^{-5}$
How many times a day is PoC provided?	ANOVA	4.61	0.0004	4.93	0.0002
Number of carers at each PoC visits	ANOVA	7.66	0.0005	8.18	0.0003

Appendix 20 - Univariable regression estimates between independent variables and IDoR

VARIABLE	ESTIMATE	P VALUE	ADJUSTED R^2
Marital status	married: reference widowed: 0.42 (-1.49, 2.34) separated: 3.69 (0.64, 6.74) single: -0.09 (-3.67, 3.49)	 0.66 0.018 0.96	0.008
Religion	Christian: reference no religion: -1.64 (-3.23, -0.06) other: 0.81 (-2.99, 4.6)	 0.04 0.68	0.007
Admitted with shortness of breath	no: reference yes: 2.48 (0.36, 4.6)	 0.02	0.01
Diagnosed with condition of digestive system	no: reference yes: -2.3 (-4.78, 0.13)	 0.06	0.006
Number of conditions the patient was diagnosed with	1: reference 2: 0.8 (-0.83, 2.45) 3: -2.2 (-4.56, 0.15)	 0.33 0.067	0.01
Past medical history of eye condition	no: reference yes: -1.8 (-3.61, -0.01)	 0.048	0.007
Past medical history of a mental health condition	no: reference yes: -2.77 (-4.75, -0.79)	 0.006	0.015
Number of past medical conditions	-0.6 (-1.09, -0.11)	0.017	0.011
Barthel Index - bathing	independent: reference dependent: -4.27 (-5.78, -2.75)	 $5.4e^{-8}$	0.07
Barthel Index - bladder	continent: reference accident: -0.52 (-2.64, 1.6) incontinent: -2.69 (-4.55, -0.83)	 0.63 0.005	0.014
Barthel Index - grooming	independent: reference dependent: -3.63 (-5.21, -2.04)	 $8.95e^{-6}$	0.044
Barthel Index - dressing	independent: reference help: -3.82 (-5.36, -2.29) dependent: -5.71 (-8.68, -2.73)	 0.0002 $1.44e^{-6}$	0.06
Barthel Index - feeding	independent: reference requires support: -4.22 (-7.48, -0.96)	 0.01	0.013
Barthel Index - mobility	independent: reference help: -2.56 (-5.29, 0.17) immobile/requires wheelchair: -5.15 (-8.78, -1.52)	 0.07 0.006	0.02
Barthel Index - stairs	independent: reference help: -2.06 (-4.22, -1.08)	 0.06	0.018

	unable: -2.96 (-4.85, -1.08)	0.002	
Barthel Index - toilet use	independent: reference help: -3.42 (-5.62, -1.21) dependent: -3.59 (-7.05, -0.12)	 0.002 0.04	 0.024
Barthel Index - transfer	independent: reference minor help: -5.05 (-8.18, -1.93) major help/ unable: -2.53 (-5.98, 0.93)	 0.002 0.15	 0.022
Optum SF-12v2 - PCS	0.29 (0.21, 0.37)	$1.2e^{-12}$	0.11
Optum SF-12v2 - MCS	0.33 (0.25, 0.41)	$3.6e^{-15}$	0.14
CFS score	managing well: reference vulnerable: 2.33 (-2.35, 7.00) mildly frail: -1.13 (-5.63, 3.36) moderately frail: -3.95 (-8.38, 0.47) severely frail: -6.31 (-11.26, -1.35)	 0.33 0.62 0.079 0.013	 0.093
PoC before admission	no: reference yes: -2.82 (-4.33, -1.32)	 0.0003	 0.029
PoC on discharge	no: reference yes: -3.15 (-4.71, -1.59)	 $8.76e^{-5}$	 0.034
PoC onset	no PoC: reference on discharge: -3.48 (-5.13, -1.83) time lapse: -2.43 (-5.66, 0.81) after intermediate care: -0.77 (-5.79, 4.26)	 $4.03e^{-5}$ 0.14 0.77	 0.034
Is a PoC required?	no: reference yes: -3.34 (-4.96, -1.73) to be determined at intermediate care: -0.47 (-6.86, 5.92)	 $5.59e^{-5}$ 0.89	 0.034
How many times a day is PoC provided?	0: reference 1: -1.51 (-4.52, 1.51) 2: -1.82 (-3.84, 0.2) 3: -5.00 (-7.33, -2.68) 4: -3.29 (-5.41, -1.18) 5: -6.58 (-13.52, 0.36)	 0.33 0.08 $2.85e^{-5}$ 0.002 0.063	 0.04
Number of carers at each PoC visits	0:reference 1: -2.93 (-4.51, -1.35) 2: -5.27 (-10.07, -0.48)	 0.0003 0.031	 0.03
Number of days PoC provided	0: reference 7: -3.29 (-4.86, -1.73) other: 3.27 (-1.49, 8.03)	 $4.45e^{-5}$ 0.177	 0.046
VARIABLES INSIGNIFICANT IN UNIVARIABLE REGRESSION MODELS			
Accommodation type	ground floor, no stairs: reference ground floor, stairs: 0.32 (-1.77, 2.4) first floor, stairs:	 0.76	 -0.006

	0.39 (-2.29, 3.08) first floor, lift: 0.99 (-1.79, 3.76)	0.78 0.49	
Admitted following a fall	no: reference yes: -0.73 (-2.27, 0.81)	0.35	-0.0003
Admitted with 'other illness'	no: reference yes: 0.62 (-1.19, 2.42)	0.5	-0.001
Admitted with 'other injury'	no: reference yes: -1.9 (-4.42, 0.59)	0.14	0.003
Admitted with an infection	no: reference yes: -1.29 (-4.79, 2.2)	0.47	-0.001
Admitted with chest pain	no: reference yes: 0.64 (-2.64, 3.92)	0.7	-0.002
Admitted with confusion	no: reference yes: 0.16 (-1.86, 2.18)	0.88	-0.002
Admitted with functional decline	no: reference yes: -0.65 (-2.9, 1.59)	0.57	-0.002
Admitted with head injury	no: reference yes: -2.22 (-5.56, 1.12)	0.19	0.002
Admitted with loss of consciousness	no: reference yes: 1.46 (-1.88, 4.8)	0.39	-0.0006
Admitted with nausea	no: reference yes: -0.58 (-2.95, 1.79)	0.63	-0.002
Age	0.003 (-0.11, 0.12)	0.96	-0.002
Barthel Index - bowels	continent: reference continence issue: -0.97 (-3.27, 1.32)	0.41	-0.0007
Diagnosed as having a fall	no: reference yes: -0.16 (-1.97, 1.64)	0.86	-0.002
Diagnosed with a condition of the circulatory system	no: reference yes: 0.05 (-1.78, 1.88)	0.96	-0.002
Diagnosed with a condition of the genitourinary system	no: reference yes: 0.29 (-1.42, 2.00)	0.74	-0.002
Diagnosed with a musculoskeletal condition	no: reference yes: 0.18 (-2.08, 2.44)	0.88	-0.002
Diagnosed with a respiratory condition	no: reference yes: 1.04 (-0.61, 2.68)	0.22	0.001
Diagnosed with a skin condition	no: reference yes: -1.21 (-3.97, 1.54)	0.39	-0.0006
Diagnosed with an 'other' condition	no: reference yes: -1.39 (-4.55, 1.77)	0.39	-0.00006
Diagnosed with delirium	no: reference yes: -0.55 (-2.42, 1.33)	0.57	-0.002
Gender	male: reference female: 1.24 (-0.38, 2.87)	0.13	0.003
Informal carer before admission	no: reference yes: 0.29 (-1.33, 1.9)	0.73	-0.002
Length between admission and recruitment	-0.02 (-0.06, 0.02)	0.41	-0.00076
Lives alone	no: reference		-0.0008

	yes: 0.68 (-0.99, 2.34)	0.42	
Number of reasons for admission	1: reference 2: 0.35 (-1.25, 1.94) 3: -1.4 (-4.33, 1.52)	 0.67 0.35	 -0.002
Past medical history of a circulatory condition	no: reference yes: -1.84 (-4.04, 0.36)	 0.1	 0.004
Past medical history of a cognitive impairment	no: reference yes: -0.2 (-1.96, 1.55)	 0.82	 -0.002
Past medical history of a digestive condition	no: reference yes: -0.47 (-2.01, 1.06)	 0.55	 -0.002
Past medical history of a genitourinary condition	no: reference yes: -1.25 (-2.81, 0.31)	 0.12	 0.004
Past medical history of a musculoskeletal condition	no: reference yes: -0.24 (-1.78, 1.31)	 0.77	 -0.002
Past medical history of a nervous system condition	no: reference yes: -0.26 (-1.98, 1.45)	 0.76	 -0.002
Past medical history of a skin condition	no: reference yes: 0.78 (-1.24, 2.8)	 0.45	 -0.001
Past medical history of a tumour	no: reference yes: -0.74 (-2.63, 1.15)	 0.44	 -0.001
Past medical history of an 'other' condition	no: reference yes: -1.24 (-3.22, 0.73)	 0.22	 0.001
Past medical history of an endocrine condition	no: reference yes: 0.25 (-1.4, 1.9)	 0.77	 -0.002
Past medical history of respiratory condition	no: reference yes: 1.05 (-0.62, 2.72)	 0.22	 0.001
Residence location	own home: reference private (other): 0.98 (-0.97, 2.94) supported accommodation: 0.08 (-1.94, 2.09) nursing home:-1.94(-7.24, 3.36)	 0.32 0.94 0.47	 -0.003
SIMD overall rank	-0.0003 (-0.0007, $9.59e^{-5}$)	0.14	0.003
SIMD quintile rank	rank 1: reference rank 2: 1.5 (-1.15, 4.14) rank 3: 1.18 (-1.65, 4.01) rank 4: 0.85 (-2.14, 3.84) rank 5: -0.19 (-2.84, 2.46)	 0.27 0.41 0.58 0.89	 -0.002

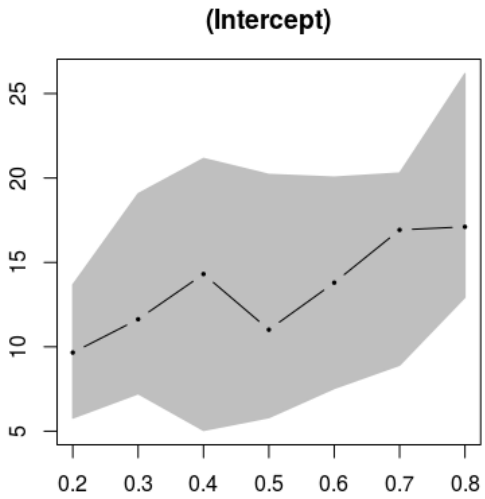
Appendix 21 - Correlation coefficients between independent variables in OLS IDoR regression model

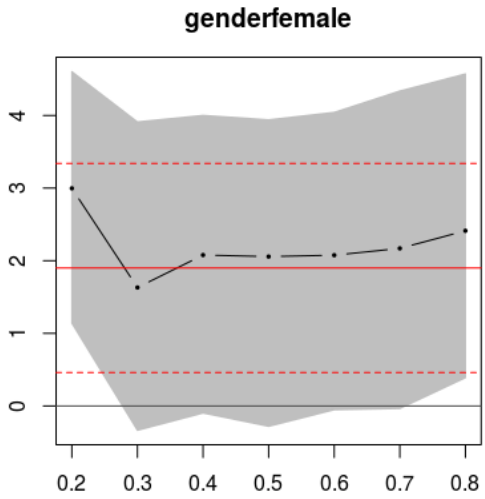
TEST / CO-EFFICIENT	MIC INDIVIDUAL SCORE	GENDER	MARITAL STATE	SF-12V2 PCS	SF-12V2 MCS	POC DAYS
MIC INDIVIDUAL SCORE	-	-	-	-	-	-
GENDER	Point-biserial 0.1	-	-	-	-	-
MARITAL STATE	Polyserial -0.001	Cramers V 0.32	-	-	-	-
SF-12V2 PCS	Pearsons 0.34	Point-Biserial -0.05	Polyserial 0.11	-	-	-
SF-12V2 MCS	Pearsons 0.37	Point-Biserial -0.02	Polyserial 0.06	Pearsons -0.05	-	-
POC DAYS	Polyserial -0.26	Cramers V 0.05	Cramers V 0.07	Polyserial -0.18	Polyserial -0.06	-

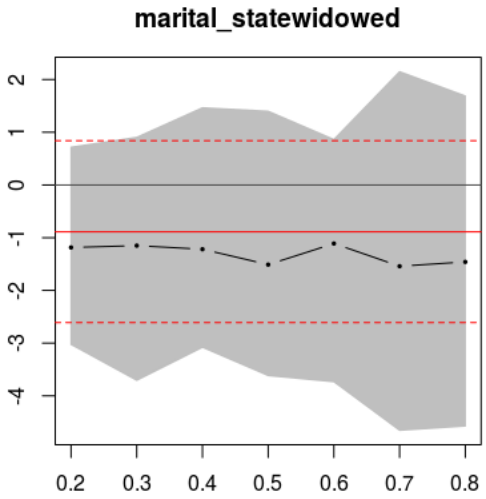
Appendix 22 - VIF values for IDoR quantile regression models

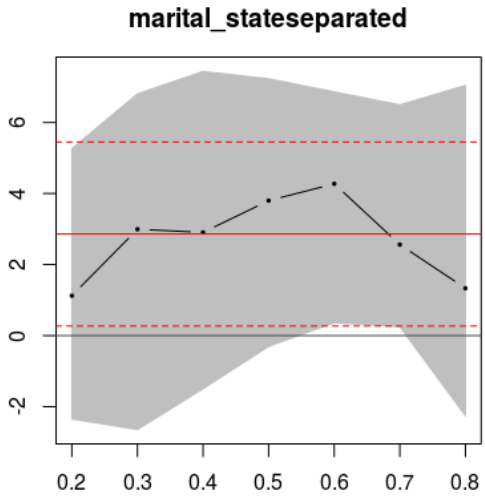
	OLS GVIF	OLS VIF	VIF values						
			0.2	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**
Female (reference Male)	1.065	1.1351	1.1117	1.1473	1.2839	1.1935	1.1415	1.1118	1.0774
Marital state (reference Married)	1.031								
Widowed		1.6927	1.5118	1.5325	1.3728	1.382	1.5712	2.5621	1.7908
Separated		1.3475	1.2217	1.1912	1.1360	1.1853	1.3528	2.4415	1.5932
Single		1.2403	1.1820	1.1852	1.0942	1.0429	1.0703	1.107	1.0876
Optum SF-12v2: PCS	1.024	1.0485	1.0447	1.0475	1.1394	1.0451	1.0594	1.0776	1.0276
Optum SF-12v2: MCS	1.014	1.0273	1.0140	1.0214	1.5639	1.0168	1.0198	1.0460	1.0425
PoC days (reference Zero)	1.015								
other		1.0564	1.0061	1.0237	3.1349	1.8308	1.0774	1.1989	1.1264
seven		1.099	1.0466	1.0619	2.53	1.8061	1.1232	1.2038	1.0951

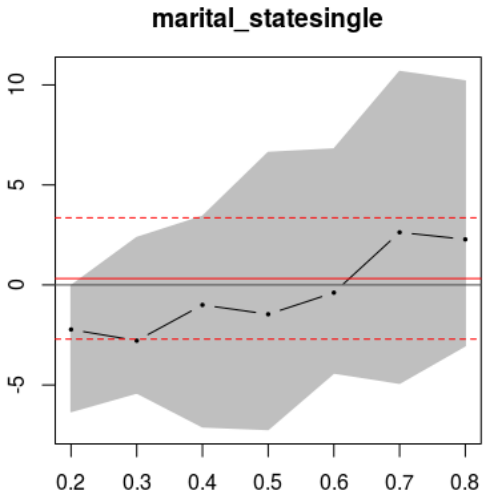
Appendix 23 - Quantile coefficients plots for IDoR subscale

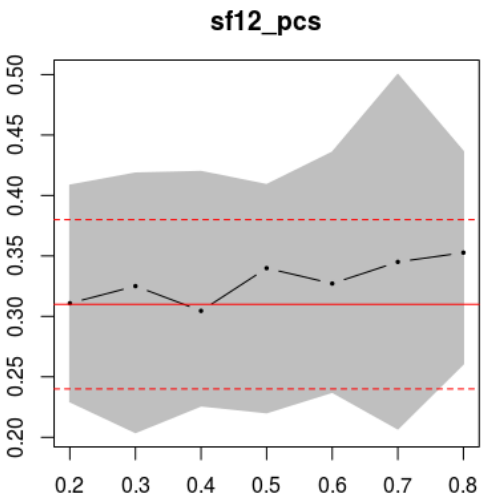








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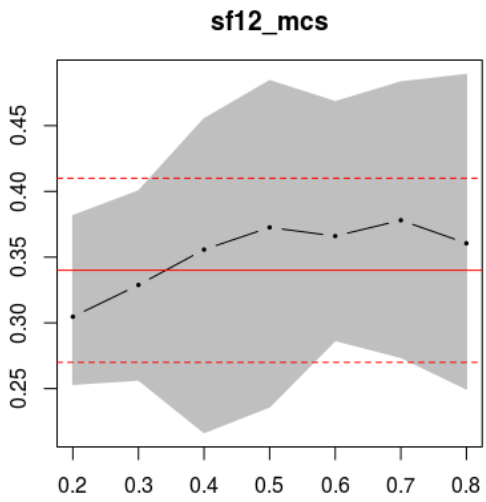
0.8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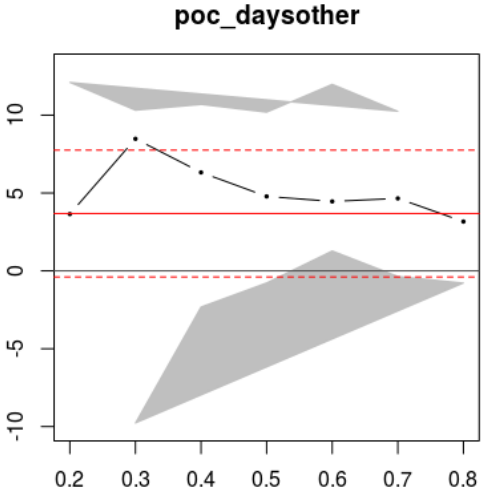
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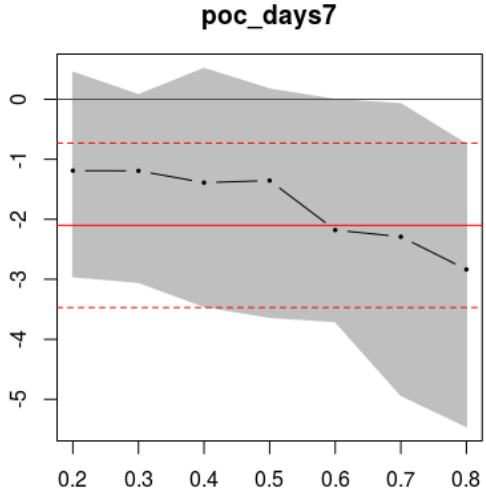
0.7
0.8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0.3
0.4
0.5
0.6
0.7
0.8

Appendix 24 - Univariable regression estimates between independent variables and EDoR

VARIABLE	ESTIMATE	P VALUE	ADJUSTED R^2
Religion	Christian: reference no religion: -1.92 (-2.94, -0.9) other: 0.79 (-1.65, 3.22)	 0.0002 0.53	 0.032
Admitted following a fall	no: reference yes: -0.97 (-1.97, 0.026)	 0.056	 0.006
Admitted with shortness of breath	no: reference yes: 1.4 (0.03, 2.79)	 0.045	 0.007
Diagnosed as having a fall	no: reference yes: -1.08 (-2.25, 0.09)	 0.07	 0.005
Diagnosed with a condition of the circulatory system	no: reference yes: 1.29 (0.1, 2.47)	 0.033	 0.009
Diagnosed with condition of digestive system	no: reference yes: -1.75 (-3.34, -0.15)	 0.03	 0.009
Past medical history of a digestive condition	no: reference yes: -0.84 (-1.84, 0.16)	 0.099	 0.004
Past medical history of eye condition	no: reference yes: -1.58 (-2.75, -0.42)	 0.008	 0.014
Past medical history of a mental health condition	no: reference yes: -1.36 (-2.66, -0.07)	 0.039	 0.008
Number of past medical conditions	-0.3 (-0.62, 0.018)	0.064	0.006
Barthel Index - bathing	independent: reference dependent: -2.9 (-3.89, -1.92)	 $1.19e^{-8}$	 0.073
Barthel Index - bladder	continent: reference incontinent: -1.21 (-2.42, 0.009) accident: 0.04 (-1.35, 1.43)	 0.052 0.95	 0.005
Barthel Index - grooming	independent: reference dependent: -1.88 (-2.92, -0.84)	 0.0004	 0.027
Barthel Index - dressing	independent: reference help: -2.27 (-3.28, -1.26) dependent: -2.22 (-4.17, -0.26)	 $1.23e^{-5}$ 0.027	 0.04
Barthel Index - feeding	independent: reference requires support: -1.9 (-4.03, 0.23)	 0.08	 0.005
Barthel Index - stairs	independent: reference help: -1.49 (-2.89, -0.09) unable: -2.27 (-3.49, -1.05)	 0.04 0.0003	 0.027
Barthel Index - toilet use	independent: reference help: -2.1 (-3.54, -0.66) dependent: -0.96 (-3.22, 1.3)	 0.004 0.4	 0.015

Barthel Index - transfer	independent: reference minor help: -3.64 (-5.67, -1.6) major help/ unable: -0.55 (-2.79, 1.7)	0.0005 0.63	0.02
Optum SF-12v2 - PCS	0.21 (0.16, 0.26)	$1.02e^{-15}$	0.14
Optum SF-12v2 - MCS	0.17 (0.12, 0.23)	$5.03e^{-10}$	0.09
CFS score	managing well: reference vulnerable: -2.3 (-5.35, 0.76) mildly frail: -3.89 (-6.82, -0.95) moderately frail: -5.91 (-8.8, -3.02) severely frail: -6.11 (-9.34, -2.88)	0.14 0.01 $6.82e^{-5}$ 0.0002	0.086
PoC before admission	no: reference yes: -1.48 (-2.46, -0.5)	0.0033	0.018
PoC on discharge	no: reference yes: -2.07 (-3.09, -1.05)	$7.35e^{-5}$	0.035
PoC onset	no PoC: reference on discharge: -2.18 (-3.25, -1.1) time lapse: -1.83 (-3.94, 0.28) after intermediate care: -0.58 (-3.86, 2.69)	$7.83e^{-5}$ 0.09 0.73	0.031
Is a PoC required?	no: reference yes: -2.12 (-3.17, -1.07) to be determined at intermediate care: -0.55 (-4.7, 3.61)	$8.57e^{-5}$ 0.8	0.032
How many times a day is PoC provided?	0: reference 1: -0.12 (-2.08, 1.84) 2: -1.95 (-3.26, -0.63) 3: -3.26 (-4.77, -1.75) 4: -2.1 (-3.47, -0.72) 5: -2.71 (-7.22, 1.8)	0.91 0.004 $2.63e^{-5}$ 0.003 0.24	0.045
Number of carers at each PoC visits	0:reference 1: -2.07 (-3.1, -1.04) 2: -2.58 (-5.7, 0.53)	$8.73e^{-5}$ 0.1	0.033
Number of days PoC provided	0: reference 7: -2.25 (-3.27, -1.22) other: 1.51 (-1.59, 4.6)	$1.92e^{-5}$ 0.34	0.047
VARIABLES INSIGNIFICANT IN UNVARIABLE REGRESSION			
Accommodation type	ground floor, no stairs: reference ground floor, stairs: -0.36 (-1.72, 0.99) first floor, stairs: -0.78 (-2.52, 0.96) first floor, lift: 0.55 (-1.26, 2.35)	0.6 0.38 0.55	-0.002

Admitted with 'other illness'	no: reference yes: 0.63 (-0.54, 1.81)	0.29	0.0003
Admitted with 'other injury'	no: reference yes: -0.94 (-2.57, 0.69)	0.26	0.0007
Admitted with an infection	no: reference yes: 1.3 (-0.97, 3.57)	0.26	0.0006
Admitted with chest pain	no: reference yes: 0.26 (-1.87, 2.4)	0.81	-0.002
Admitted with confusion	no: reference yes: 0.42 (-0.9, 1.73)	0.53	-0.001
Admitted with functional decline	no: reference yes: -0.92 (-2.38, 0.53)	0.21	0.001
Admitted with head injury	no: reference yes: -1.75 (-3.92, 0.42)	0.11	0.004
Admitted with loss of consciousness	no: reference yes: 1.56 (-0.61, 3.73)	0.16	0.002
Admitted with nausea	no: reference yes: -0.02 (-1.57, 1.52)	0.98	-0.002
Age	-0.012 (-0.09, 0.06)	0.75	-0.002
Barthel Index - bowels	continent: reference continence issue: -0.28 (-1.77, 1.21)	0.72	-0.002
Barthel Index - mobility	independent: reference help: -1.3 (-3.09, 0.49) immobile/requires wheelchair: -1.89 (-4.27, 0.49)	0.16 0.12	 0.005
Diagnosed with a condition of the genitourinary system	no: reference yes: -0.13 (-1.24, 0.99)	0.83	-0.002
Diagnosed with a musculoskeletal condition	no: reference yes: -0.16 (-1.63, 1.3)	0.83	-0.002
Diagnosed with a respiratory condition	no: reference yes: 0.26 (-0.81, 1.33)	0.63	-0.002
Diagnosed with a skin condition	no: reference yes: 0.82 (-0.97, 2.62)	0.37	-0.0004
Diagnosed with an 'other' condition	no: reference yes: -0.16 (-2.22, 1.89)	0.88	-0.002
Diagnosed with delirium	no: reference yes: 0.14 (-1.08, 1.36)	0.82	-0.002
Gender	male: reference female: 0.63 (-0.43, 1.86)	0.25	0.0008
Informal carer before admission	no: reference yes: -0.35 (-1.4, 0.7)	0.52	-0.001
Length between admission and recruitment	-0.007 (-0.033, 0.019)	0.59	-0.002
Lives alone	no: reference yes: 0.27 (-0.81, 1.35)	0.62	-0.002
Marital status	married: reference widowed: -0.25 (-1.5, 1.00) separated: 0.3 (-1.69, 2.3)	0.7 0.77	

	single: -1.6 (-3.94, 0.74)	0.18	-0.002
Number of conditions the patient was diagnosed with	1: reference 2: 0.19 (-0.88, 1.26) 3: -0.75 (-2.29, 0.79)	 0.72 0.34	 -0.001
Number of reasons for admission	1: reference 2: 0.24 (-0.8, 1.28) 3: 0.16 (-1.75, 2.06)	 0.65 0.87	 -0.004
Past medical history of a circulatory condition	no: reference yes: -0.93 (-2.36, 0.51)	 0.2	 0.001
Past medical history of a cognitive impairment	no: reference yes: 0.16 (-0.99, 1.3)	 0.79	 -0.002
Past medical history of a genitourinary condition	no: reference yes: -0.15 (-1.17, 0.86)	 0.77	 -0.002
Past medical history of a musculoskeletal condition	no: reference yes: 0.03 (-0.98, 1.03)	 0.96	 -0.002
Past medical history of a nervous system condition	no: reference yes: -0.5 (-1.61, 0.62)	 0.38	 -0.0005
Past medical history of a skin condition	no: reference yes: 0.3 (-1.01, 1.62)	 0.65	 -0.002
Past medical history of a tumour	no: reference yes: 0.94 (-0.28, 2.17)	 0.13	 0.003
Past medical history of an 'other' condition	no: reference yes: -0.83 (-2.12, 0.45)	 0.2	 0.002
Past medical history of an endocrine condition	no: reference yes: -0.11 (-1.18, 0.96)	 0.84	 -0.002
Past medical history of respiratory condition	no: reference yes: 0.61 (-0.48, 1.69)	 0.27	 0.0005
Residence location	own home: reference private (other): -0.087 (-1.36, 1.18) supported accommodation: 0.73 (-0.58, 2.04) nursing home: 0.73 (-2.72, 4.18)	 0.89 0.28 0.68	 -0.004
SIMD overall rank	$-3.615e^{-5}$ (-0.0003, $2.8e^{-4}$)	0.77	-0.002
SIMD quintile rank	rank 1: reference rank 2: 0.68 (-1.04, 2.4) rank 3: 0.34 (-1.5, 2.4) rank 4: 0.44 (-1.5, 2.18) rank 5: 0.2 (-1.52, 1.93)	 0.44 0.72 0.66 0.82	 -0.008

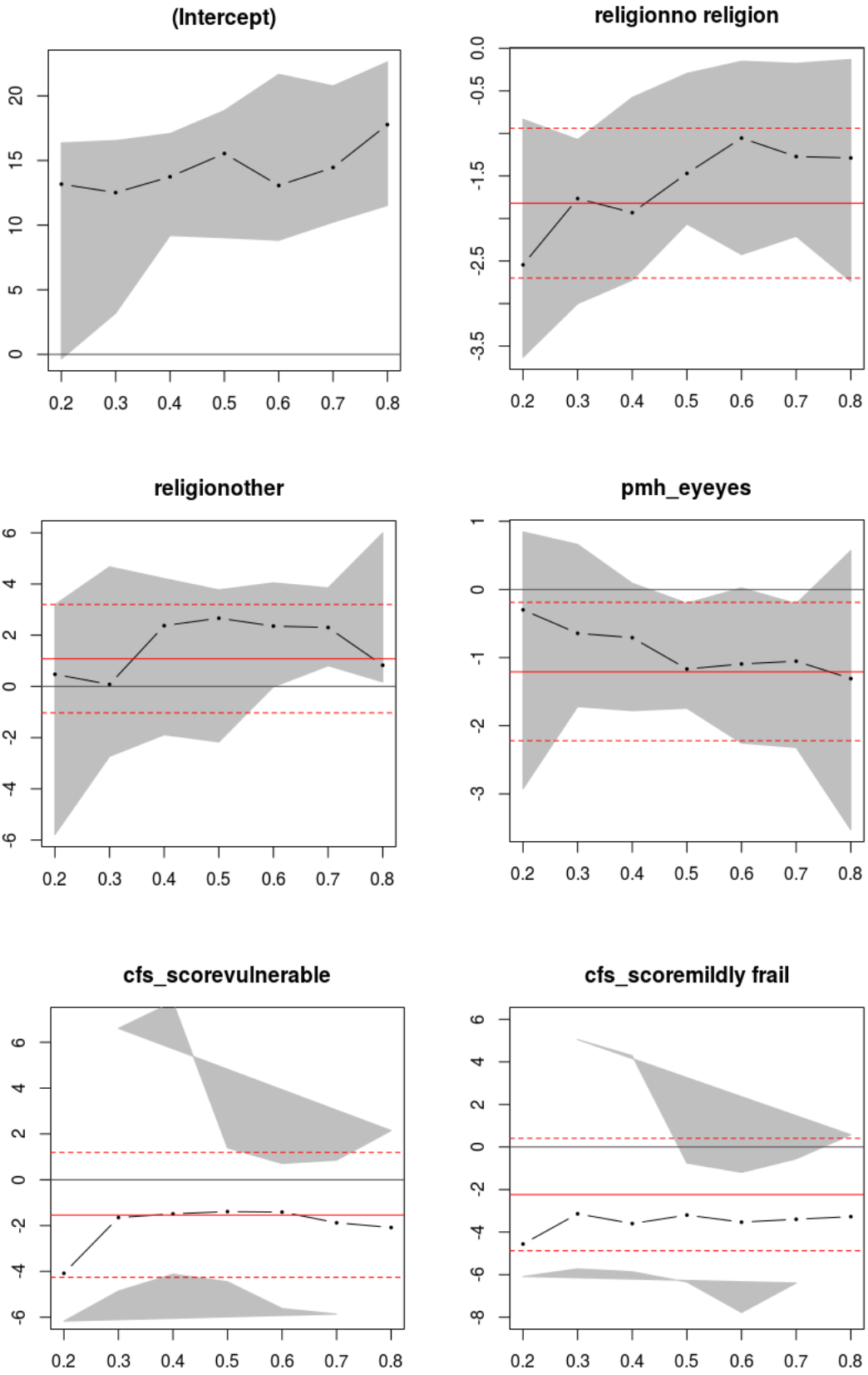
Appendix 25 - Correlation coefficients between independent variables in OLS EDoR regression model

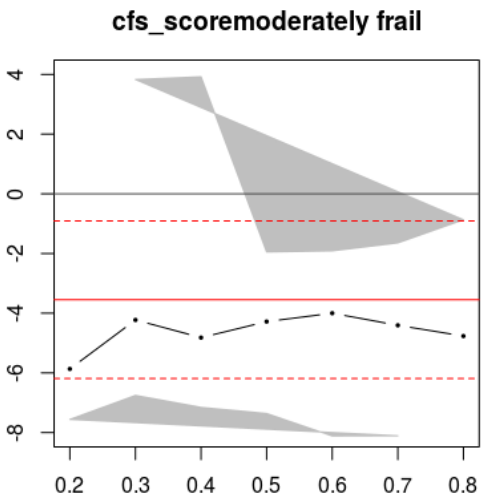
TEST / CO-EFFICIENT	MIC ENVIRO-NMENT SCORE	RELIGION	CFS SCORE	PAST MEDICAL HISTORY OF AN EYE CONDI-TION	SF-12V2 PCS	SF-12V2 MCS
MIC ENVIRON-MENT SCORE	-	-	-	-	-	-
RELIGION	Polyserial -0.19	-	-	-	-	-
CFS SCORE	Polyserial 0.10	Cramers V 0	-	-	-	-
PAST MEDICAL HISTORY OF AN EYE CONDITION	Point-biserial -0.18	Cramers V 0.13	Cramers V 0.14	-	-	-
SF-12V2 PCS	Pearsons 0.38	Polyserial -0.05	Polyserial -0.003	Point biserial -0.05	-	-
SF-12V2 MCS	Pearsons 0.29	Polyserial -0.08	Polyserial 0.04	Point biserial -0.04	Pearsons -0.05	-

Appendix 26 - VIF values for EDoR quantile regression models

			VIF values						
	OLS GVIF	**OLS VIF**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**
Religion (reference Christian)	1.015								
Atheist		1.0566	1.0791	1.0315	1.0337	1.0447	1.1090	1.3083	1.9995
Other		1.0726	1.1652	1.022	1.0168	1.052	1.4071	1.5946	1.8240
CFS score (reference Managing well)	1.029								
Vulnerable		5.2319	17.3459	1.9137	4.1717	3.5483	11.0522	11.2171	3.6294
Mildly frail		8.2317	65.5770	5.5765	9.3925	7.0631	8.7555	8.1122	2.796
Moderately frail		9.9556	71.8256	6.3046	10.5643	6.7727	12.7184	15.3956	8.1091
Severely frail		4.0747	8.7827	3.3152	5.6661	3.1743	1.8433	2.5515	18.3639
Past medical history of an eye condition (reference No)	*1.027*	1.0543	1.0380	1.0768	1.06655	1.0864	1.099	1.1207	1.4854
Optum SF-12v2: PCS	*1.091*	1.1911	1.0907	1.2744	1.1859	1.2756	1.2133	1.1324	3.6568
Optum SF-12v2: MCS	*1.008*	1.0168	1.0196	1.0244	1.0216	1.0480	1.035	1.0757	1.0420

Appendix 27 - Quantile coefficients plots for EDoR subscale

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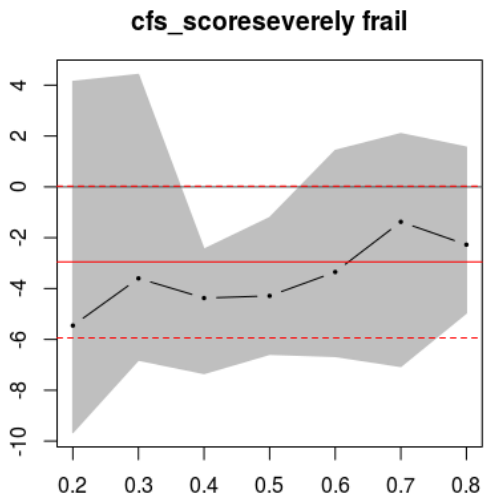
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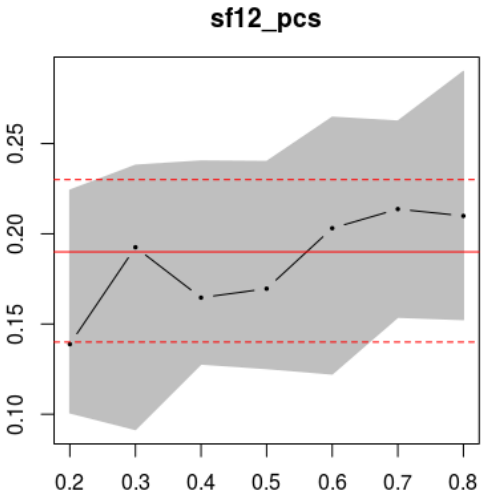
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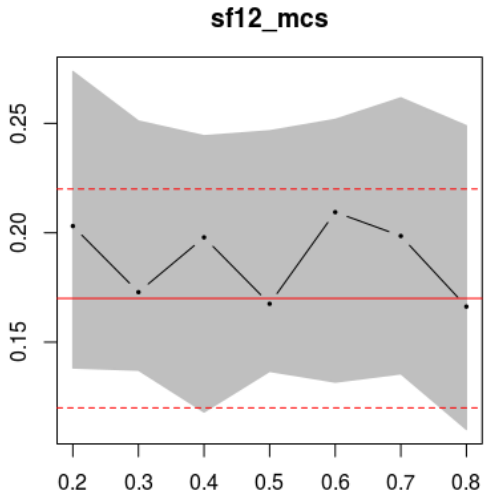
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0.4
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0.8

Appendix 28 - Future publication plans

WORKING TITLE	CORRESPONDING THESIS SECTIONS	TARGET AUDIENCE	1ST TARGET JOURNAL IMPACT FACTOR	2ND TARGET JOURNAL IMPACT FACTOR
Psychometric Analysis of the Making it CLEAR (MiC) questionnaire: Validation of a Multidimensional Measure of Older Adults' Resilience	Section 6.4 - EFA and Item Analysis Section 7.3 - Discussion surrounding the quality of the MiC Questionnaire	Gerontological/Resilience researchers Geriatric Care Clinical Service Managers	The Journal of Gerontology: Psychological Sciences 3.502	Psychology and Aging 2.107
Factors Affecting Older Adults' Resilience in Medicine of the Elderly Wards: A Quantile Regression Approach	Section 6.6 - OLS Regression analysis and Quantile Regression analysis Section 7.5 - Discussion surrounding protective and vulnerability factors	Hospital-based Multidisciplinary Teams and Clinical Service Managers Quantitative health/medical researchers	Journal of Gerontology: Medical Sciences 5.236	The Gerontologist 3.286
Resilience in Older Adults: Addressing the Unique Needs of Hospital Inpatients	Section 6.5 - Item Response Analysis and ANOVAs/correlation coefficients Section 7.4 - Discussion surrounding 'resilience needs'	Hospital-based Multidisciplinary Teams and Clinical Service Managers Social Workers Clinical Commissioning Groups and NHS bodies responsible for the planning of local health care services	The Gerontologist 3.286	Journal of Applied Gerontology 2.144